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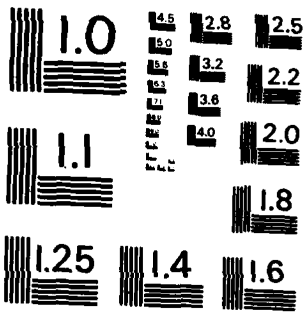


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

8

*appendixes*

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APPENDIX 1 – GEOLOGY AND SOILS

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## APPENDIX 1

1. SCOPE. The appendix deals with geologic conditions and soils in the area of proposed dredging for improvement of San Diego Harbor.

2. TOPOGRAPHY. San Diego Bay is a crescent-shaped body of water in the terraced coastal plain forming the southern end of the California coast. The bay ranges in width from 1/4 mile at its entrance on the northwest end to about 2-1/2 miles at the center. The bay is about 14 miles long, if measured around the crescent, and has an area of about 22 square miles. The International Boundary is about 4 miles from the south end and 15 miles from the north end. Point Loma, a terraced promontory 430 feet high, forms the north boundary of the bay. The 30-foot-high Peninsula of San Diego, including Silver Strand, extends in a northwesterly direction from the mainland at Imperial Beach and separates the bay from the Pacific Ocean, leaving only the narrow entrance near Point Loma connecting with the sea. A gently sloping coastal plain borders the remainder of the bay shore and extends to more or less distant terraces except where interrupted by valleys of ephemeral rivers and their associated deltas. The natural shoreline has been modified extensively by harbor development and other works of man.

3. GEOLOGY. Unconsolidated sediments border and lie underneath San Diego Bay except for harder sedimentary rocks of Point Loma on the northernmost border. Sand and silt is most common; however, clay and minor lenses of gravel are present. The nearest hard metamorphic or granitic rocks are 6 miles east of the bay. Geologic structure is less complex than is generally found in southern California. None of the sedimentary rocks have been greatly deformed and their total thickness is less than 6,000 feet. Only minor folds and faults have been found in the San Diego area. This situation is a great contrast to the tens of thousands of feet of folded, faulted and overthrust rocks found in some other Tertiary sedimentary basins of California. Mild structural events have, however, left their mark in a series of terraces which can be recognized on higher portions of the area around the bay.

4. REGIONAL STRUCTURAL GEOLOGY. San Diego Harbor is situated southwest of a group of active fault zones found 43 to 92 miles from the channel being deepened in San Diego Harbor. These zones have received much attention in studies of crustal movement in Imperial Valley. The faults shown in the northeast corner of plate 1-7, Regional Structural Geology, are a southeast extension of the Elsinor fault zone. The most active faults of the group are a southeastward extension of San Jacinto fault zone (67 miles from the project) and a southeastward extension of San Andres fault zone (92 miles away). Crustal movement within historical time has been measured at these last two zones. Recent structural geology studies in the greater San Diego area have shown the Rose Canyon fault zone and La Nacion fault may be of substantial geologic importance. They are known to have displaced beds of the Lindavista formation (500,000 to 3,000,000 years old) but do not displace Recent alluvium. The alinement of the faults suggest they result from the same stress pattern that has affected more active faults in

Imperial Valley, Baja California, and the Gulf of California. San Diego Bay appears to be less active geologically than many portions of southern California.

5. GROUND WATER. The entire project is in the area of the tidal prism, in a region where fresh water is added only by ephemeral streams. No effect on ground water or by it is expected at the project.

6. EARTHQUAKES. During the last century earthquakes have occurred in this region often enough to show that it is subject to seismic shocks of considerable intensity. Only a few strong earthquakes have been experienced within a radius of fifty miles; however, ten recorded earthquakes with maximum intensities of VIII to X, Modified Mercalli, had epicenters within a radius of 100 miles. Consequently, San Diego Harbor is within Zone 3 of the Seismic Risk Map in "United States Earthquakes, 1968," published by the Coast and Geodetic Survey in 1970.

7. EXPLORATION AND TESTING. During October and November 1970, 31 test holes were drilled 500 to 2,800 feet apart throughout the area of proposed improvements, except for a gap of 6,500 feet, where utility crossings prevented exploration. The holes extended to the depths of the proposed dredging or deeper. Hole locations are shown on plate 1-1. The locations were determined by horizontal sextant angles between reference points on Coast and Geodetic Survey Chart 5107, Edition of 11 April 1970. Elevations are based on tide charts and soundings obtained with a weighted tape. Forty- six field tests were made to indicate the relative density or consistency of materials encountered. Laboratory tests were made to classify each sample secured in order to evaluate the qualities of the material when delivered from the discharge pipe of a dredge. Conferences in 1971 resulted in the decision that samples for special environmental tests were required throughout the study area. These environmental samples were taken from 36 drill barge locations in June 1971. They included 72 surface samples and 28 drive samples. All were placed in a dry ice-cooled refrigerator soon after recovery. The frozen samples and dry ice were packed in shipping containers and sent by air to the Environmental Protection Agency laboratory for their analysis. Biological analyses were not made as the EPA laboratory had no mobile equipment available and frozen material is not suitable for bioassay.

8. In December 1971, an additional 18 samples were taken from the bottom of the bay for analysis. All samples were iced at the time of recovery and were continually covered with ice until delivered to the laboratory. All samples were delivered by truck – five to the EPA laboratory in Alameda, and 13 to the South Pacific Division, Corps of Engineers laboratory in Sausalito. In January 1972, five additional cores were taken from the bottom of the bay and submitted to the South Pacific Division laboratory, in Sausalito for analysis. All cores were iced at the time of recovery and kept covered with ice until delivered to the laboratory by truck.

9. On 2 August 1972, a cooperative sampling trip was made offshore from Silver Strand between Coronado and the International Border by the Unified Port District, Regional Water Quality Control Board, and the Los Angeles District. One sample was

taken by SCUBA divers of surficial material at each of 10 locations with elevations ranging from 10 to 26 feet below mean lower low water.

10. During December 1972, investigation was made inside the harbor in the reach between approximate channel mile points 10.2 and 11.6 to secure more detailed information about quantity and character of relatively soft material.

11. The Unified Port District drilled three holes in March 1973 at an area one mile southwest from harbor mile 11 as part of evaluating a plan for disposal of one class of dredge spoil. The Corps of Engineers sampled material recovered and tested it for environmental qualities.

12. EXPLORATION. In the 1970 exploration, each hole was drilled from an anchored barge. Direct jetting normally advanced the hole rapidly, however, rotation of the drill was needed at some intervals. Ocean water was pumped through "A" rods (1-1/8 inch I.D., 1-5/8-inch O.D.) and returned through "NX" casing (3-inch I.D.) to the deck of the barge. Samples were generally secured by directing the return wash water into a four compartment settling tank and saving a portion of material collected by each compartment during advance for each sample interval. Practically no material escaped collection in the largest compartment. Circulation was continued after each advance of the hole until only clear water was returned. The settling tank was emptied after each sample interval. Although mixing and segregation of materials prevent identifying thin, noncohesive layers, the material of each sample is believed reasonably representative of material which a suction dredge would deliver. Four samples were taken from the exposed foreshore at Silver Strand Beach State Park to compare with materials encountered in the area of proposed dredging for harbor improvement. Each sample was a composite surface sample taken from the waterline to the mark of the preceding higher high tide. The reach which was sampled extended from Station 343 (near the northwest edge of parking lot No. 4) to Station 387 (near the booth at the park entrance). The station of each sample was scaled from the Corps of Engineers Hydrographic Base Line plotted on a copy of Coast and Geodetic Survey Chart 5107, Edition of 1970, Scale 1/20,000. Table 1 shows results of tests on the Silver Strand sand samples. In the June 1971 sampling, underwater surface samples were secured from a barge by using a bailer of 4-inch outside diameter pipe pulled by a chain attached to hold the open end against soil and loose material of the bottom of the bay. The 1971 drive samples were secured with a Shelby tube drive sampler equipped with a 2-1/8-inch I.D., 2-1/4-inch O.D. clear 33B-Butyrate plastic liner.

13. The underwater samples of the bay bottom obtained in December 1971 were obtained from boat furnished by the Unified Port District. Personnel from the Los Angeles District and the Unified Port District obtained the samples with a Hayward orange-peel sampler and with a sampler developed by Mr. Robert E. Louden, formerly of the Corps of Engineers. The sampler developed by Mr. Louden was used at four locations where the bottom of the bay was too hard to obtain a sample with the Hayward sampler. Five additional cores from the bay bottom were obtained in January of 1972. A diver, using a jackhammer, a steel tube containing a plastic tube, and a water jet, obtained the

cores under private contract. The plastic tube varied the core sample. The plastic tube was removed from the steel tube, sealed and shipped to the Division laboratory in Sausalito, where it was opened, classified and analyzed.

14. On 2 August 1972, the Unified Port District work boat "J.D. Murphy" carried SCUBA divers from the Regional Water Quality Control Board and personnel from the Los Angeles District, Corps of Engineers, on a traverse seaward of the breaker line from the harbor entrance to the international border. At 10 locations between Coronado and the border the SCUBA divers took samples of the surface material at the ocean bottom. Each sample was iced immediately and kept chilled until final delivery to the South Pacific Division laboratory in Sausalito, California.

15. The exploration of December 1972, consisted of sampling and probing by a helmeted diver. Continous voice communication was maintained between the diver and the attending boat. A series of sections were made. The diver probed with a steel rod to determine how far he could penetrate by hand operation and described the feel of the rod as he worked. Each numbered probing resulted from several penetrations in the local area. At least one probing location of each section was supplemented by sampling to the depth of 2-1/2 or 3 inch sampling tube could penetrate when driven by hand tools. Each sample was placed in a glass jar, iced immediately, and kept chilled until delivered to the South Pacific Division laboratory in Sausalito, California. Elevation was determined from tide tables and depth of water was measured with a pressure gage reading directly in feet of sea water above the open end of the tube connected to the gage. This method made it possible for the diver to establish almost 5.0 feet of relief at one location by holding the open end of the tube at a low point and also at an adjacent high point while describing by voice the condition he was measuring. Locations were determined by means of a sextant and a three arm protractor, using navigation aids and piers shown on C. and G.S. Chart 5105 as references.

16. Exploration of March 1973 was done by the Unified Port District to locate a place where burial of nonstructural fill would be feasible. A "Failing 1500" drill rig, mounted on a 105 x 30 foot barge, drilled with rotary equipment circulating clear sea water and sampled using conventional sampling spoons. Each hole was cased as sampling progressed. The procedure was to drive the sampler, remove the sample, and ice it immediately, drive the casing to the bottom elevation of the pervious sample, clean material out of the casing, and then repeat the cycle. Normal advance was 2 feet per cycle regardless of the depth interval included in each sample. Elevations were computed using measured depths and tide charts. Location coordinates were scaled from Coast and Geodetic Survey Chart 5105 (1 *inch=1000 feet)* after plotting each drilled hole by means of a three arm protractor and sextant angles observed between navigation aids or identifiable points on the chart. All samples were kept chilled until delivered to the cold room at the South Pacific Division laboratory.

17. FIELD TESTING. One or more standard penetration tests were made at each hole to indicate the relative density or consistency of materials encountered in the 1970 exploration. The first test at each hole was made after the barge was anchored and casing was lowered to the bottom of the bay. The test was offset about 3 feet from the actual hole. Any subsequent tests were made through the casing. Surficial material at some locations was loose or soft enough for the standard penetration equipment to penetrate several feet by its own weight without driving. A more complete description of the test equipment is in the legend of plate 1-2. Results of the tests are presented on plates 1-1 and 1-2. The sampling spoon of the equipment did not retain material on some tests; however, any sample recovered was saved and tested. Table 1-2 shows depth of spoon samples, depth of adjacent or overlapping washed samples and comparative laboratory test results.

18. LABORATORY TESTING. Tests on the samples were conducted in the Los Angeles District laboratory to determine Atterberg limits and perform mechanical analysis. The soils were classified in accordance with the Unified Soils Classification System. The logs on plates 1-1 and 1-2 include the results of the laboratory tests and also remarks based on field observation during drilling. Environmental test samples were tested in the Environmental Protection Agency laboratory at Alameda, California, and the South Pacific Division laboratory in Sausalito with methods described in Report 1-1 and other inclosures. A special series of tests were made in December 1971 on a few samples as described in Report 1-2, SPD Laboratory Report dated February 1972, Pollutants in Sand and in Silt or Clay Fractions, and as shown in tables 4,5, and 6 prepared by the Environmental Protection Agency laboratory. Several samples were separated into one fraction finer than .074 mm (No. 200 Sieve) and a sand-size fraction. Each fraction was analyzed separately to determine environmental qualities. Sea water was analyzed before and after contact with samples to determine if it would remove pollutants from the material and retain them in relatively clear water separated from the mixture of sediment and sea water.

19. RESULTS OF EXPLORATION AND TESTING. Materials between the bottom of the bay and the proposed project depths classify generally as fine to coarse sand. Sandy silt, silty sand, clayey sand, silt and clay were encountered by some of the test holes. The thickest section of material to be excavated is at the mouth of Sweetwater River, an ephemeral stream, which has been developed with storage reservoirs, which close off much of the drainage area. Loose surficial material on the bottom of the bay ranges in thickness from 0 to 6.4 feet. This thickness was determined by subtracting the elevation of the bottom of the standard penetration device, when it came to rest before driving was started, from the elevation of the bottom of the bay when sounded with a tape. Any sharp irregularity of the surface of the bottom of the bay such as a dune-like ripple or overdredged spot would affect the apparent thickness shown. Detailed probing and sampling between harbor miles 10.2 and 11.6 was done by a helmeted diver. Thickness of soft material was determined during this detailed work by direct underwater observation.

a. Materials near mile 3.0 were fine sand with shell fragments. Samples were taken and subjected to the seven EPA basic tests. Three surface samples showed all test values below the EPA limiting values of 1971. One surface sample exceeded the limit for zinc. One tube sample showed all test values below the EPA limits. One tube sample was divided into three sub-samples. The upper sub-sample was divided into fines passing a No. 200 sieve, and sand material coarser than a No. 4 sieve was discarded without testing. The fines exceeded limits for all seven basic tests. The sand showed all test values below limits. The other two sub-samples were each tested without separation of fines. Each whole sample showed all test values below the EPA limits of 1971.

b. Materials near mile 4.6 were silty, fine sand. Samples were taken and subjected to the seven EPA basic tests. Two samples showed all test values below the 1971 EPA limit values. One sample exceeded the limits for only mercury and two samples exceeded the limits for only zinc.

c. The three holes between miles 6.0 and 7.8 encountered only fine sand. The sand encountered above the elevation of 42 feet below mean lower low water is slightly coarser than the sand on the wave-washed slope of Silver Strand Beach Park. Samples were taken and subjected to the seven EPA basic tests. The surface at some sample locations was below the project depth; however, the samples were taken and tested as an indication of surface material in the area. All surface samples exceeded the EPA limits of 1971 in 1 to 7 of the basic tests. Tests on tube samples show materials 2 feet below the surface give test values lower than 1971 EPA limiting values.

d. The six holes between miles 7.8 and 8.84 encountered sand, silty sand and clay. The one interval of clay above the proposed project depth of 40 feet below MLLW is the bottom 1.2 feet of an 8.2-foot cut needed at the location of hole 70-6. The entire 6.7-foot cut needed at hole 70-6 will encounter silty sand which would leave satisfactory beach sand if silt particles, comprising about one-third of the material, are washed out during the dredging operation or by wave action after deposition. Except for materials mentioned above, the material above an elevation of 40 feet below MLLW encountered in holes of this reach is roughly comparable to material sampled on Silver Strand Beach. Samples were taken and subjected to the seven EPA basic tests. Of 16 surface samples in the reach three showed all test values lower than the 1971 EPA limiting values, seven exceeded only the limit for zinc, three exceeded the limits for Kjeldahl nitrogen and zinc, and three exceeded the limiting values on three tests. None of the tube samples more than two feet below the surface exceeded more than one 1971 EPA limiting values of the seven basic tests. Most exceeded only the limit for zinc, one exceeded only the limit for Kjeldahl nitrogen, and four showed values.

e. The seven holes between miles 8.84 and 10.3 encountered sand ranging from coarser to finer than the sand sampled at Silver Strand Beach. Many of the coarser sand particles are shell fragments. Samples were taken and subjected to the seven EPA basic tests. All 12 surface samples exceeded the 1971 EPA limit for zinc, and none exceeded

the limiting value for more than two tests. Four samples also exceeded the value for lead, three the limiting value for Kjeldahl nitrogen, and two the limit for oil and grease. Two series of tests were made on portions of a tube sample more than 2 feet below the surface. One series gave all values lower than the 1971 EPA limiting values and one exceeded only the limit for zinc.

f. Six of the eight holes drilled between miles 10.2 and 12.0 encountered material which would produce clay lumps or material which would settle slowly out of fluid discharged by a dredge. The holes in this reach, which encountered sand above the proposed project depth—35 feet below mean lower low water, gave samples which were substantially finer than the sand sampled at Silver Strand Beach. Samples were taken and subjected to the seven EPA basic tests in 1971 and 1972. The reach from harbor miles 10.2 and 11.6 had 17 surface samples. Of these samples, three or more of the EPA limiting values were exceeded in the 15 tested. The remaining two exceeded the limit for zinc, and one also exceeded the limit for oil and grease. One deep tube sample was in the reach. The tube sample from 3 to 10 feet below the surface was subdivided into five test samples. One exceeded the limiting value for zinc and the other four gave all test values lower than the EPA limiting values.

g. The reach from mile 12.0 to 13.5 included the mouth of Sweetwater River. Materials encountered by the seven holes in this reach are deltaic deposits, formed before control of the thin, ephemeral river. Three intervals of clay, 6 feet thick or thinner, were encountered above the proposed project depth of 35 feet below mean lower low water at separated depths and locations, which suggest they represent scattered lenses which may occur at various positions in the deltaic deposits. Four comparable intervals contained sandy silt and silty sand, with 25 percent or more of each sample passing a 200-mesh sieve. These intervals represent 16 percent of the 213 feet of material penetrated above the proposed project depth in this reach. The remaining 84 percent was sand or silty sand, with less than 25 percent of each sample passing a No. 200 sieve. About 44 percent of the 213 feet of material being considered was sand equivalent to or coarser than the sand sampled at Silver Strand Beach and 40 percent was of distinctly finer sand. The results of the analyses of the environmental test samples are given in this appendix.

h. Several features appear to apply to the San Diego Bay in general: (1) Concentration of heavy metals and other pollutants are seldom found more than a few feet below the bottom of the bay; (2) They are associated with the silt-clay-colloid particle-size fractions of polluted sediments. One example is found in 0 to 44-1/2 inches depth of Hole EllE, where the whole sample exceeded only the 1971 EPA limit for zinc; the fraction finer than 0.074 mm ("flock") exceed the 1971 EPA limits for all basic seven tests, and the sand fraction did not exceed the limit for any of the basic seven tests. Sea water in contact with sediments does not remove and accumulate metals determined by the EPA test series. Pollutants which were absorbed by the sea water did not exceed any of the 1971 EPA limits.

TABLE I-I

NAVIGATION IMPROVEMENT SAN DIEGO HARBOR, CALIFORNIA
SILVER STRAND BEACH STATE PARK, TEST RESULTS ON SAND SAMPLES

| SAMPLE NUMBER | TYPE SAMPLE | ELEV. FEET ABOVE MLLW | UNIF. SOIL CLASS. | PERCENT PASSING SIEVE SHOWN -3/8 | -4 | -10 | -30 | -60 | -100 | -200 | LL | PI | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SURF. | 3.5 TO 6.2 | SP | | | | 100 | 69 | 17 | 4 | | NP | 10 NOV 70 STA 356 |
| 2 | SURF. | 1.2 TO 6.8 | SP | | | 100 | 99 | 69 | 16 | 2 | | NP | 13 NOV 70 STA 343 |
| 3 | SURF. | 0.8 TO 6.8 | SP | | | 100 | 99 | 68 | 17 | 2 | | NP | 13 NOV 70 STA 356 |
| 4 | SURF. | 0.5 TO 6.8 | SP | | | 100 | 99 | 70 | 16 | 2 | | NP | 13 NOV 70 STA 387 |

For explanatory Notes see Legend on drawing's "Location and Test Hole Logs".

TABLE I-2

NAVIGATION IMPROVEMENT SAN DIECO HARBOR, CALIFORNIA

COMPARISON OF SPOON AND WASH SAMPLES OF 1970

| HOLE NO. | TYPE SAMPLE | DEPTH | UNIF. SOIL CLASS | PERCENT PASSING SIEVE SHOWN -3/8 | -4 | -10 | -30 | -60 | -100 | -200 | LL | PI | N | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70-1 | SPOON | 0-3.5 | SP/SM | 98 | 86 | 86 | 40 | 28 | 18 | 8 | | NP | 10 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-1 | WASH | 0-6.8 | SP | | 100 | 94 | 85 | 68 | 26 | 3 | | NP | | SHELL FRAGMENTS ON # 10. |
| 70-2 | SPOON | 0-4.8 | SP/SM | 100 | 98 | 95 | 83 | 66 | 30 | 12 | | NP | 13 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-2 | WASH | 0-8.6 | SP | 100 | 95 | 87 | 70 | 52 | 20 | 3 | | NP | | SHELL FRAGMENTS ON # 4. |
| 70-3 | SPOON | 0-2.4 | SM | 99 | 97 | 79 | 56 | 41 | 26 | 13 | | NP | 7 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-3 | WASH | 0-11.7 | SP | 100 | 99 | 83 | 74 | 53 | 13 | 3 | | NP | | |
| 70-7 | SPOON | 0-4.5 | SP/SM | 99 | 98 | 96 | 94 | 83 | 22 | 5 | | NP | 10 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-7 | WASH | 0-4.9 | SP | | 100 | 98 | 90 | 78 | 27 | 3 | | NP | | |
| 70-9 | SPOON | 0-4.1 | SM | 100 | 98 | 96 | 91 | 57 | 24 | 14 | | NP | 15 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-9 | WASH | 0-10 | SP | | 100 | 99 | 89 | 47 | 8 | 2 | | NP | | |
| 70-10 | SPOON | 0-3 | SM | 100 | 98 | 95 | 83 | 59 | 35 | 13 | | NP | 3 | SHELL FRAGMENTS ON # 4, 10. |
| 70-10 | WASH | 0-5 | SC | 96 | 89 | 82 | 63 | 37 | 25 | 18 | 30 | 13 | | ROCK GRAVEL ON # 3/8, 4. |
| 70-10 | WASH | 9-12 | SC | | | | 100 | 97 | 77 | 5 | | NP | | |
| 70-10 | SPOON | 12-14 | SP/SM | | 100 | 99 | 98 | 95 | 71 | 10 | | NP | 56 | |
| 70-11 | SPOON | 0-3.5 | SW/SM | 100 | 99 | 98 | 94 | 74 | 28 | 9 | | NP | 11 | SHELL FRAGMENTS ON # 4, 10, 20, 30. |
| 70-11 | WASH | 0-7 | SW/SM | 100 | 99 | 93 | 82 | 60 | 18 | 7 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20, 30. |
| 70-12 | SPOON | 0-4.1 | SP/SM | 99 | 95 | 88 | 64 | 39 | 18 | 8 | | NP | 15 | |
| 70-12 | WASH | 0-5.0 | SP | 100 | 96 | 84 | 42 | 21 | 5 | 2 | | NP | | SHELL FRAGMENTS ON # 4, 10. |
| 70-13 | SPOON | 0-3.4 | SP/SM | 100 | 93 | 86 | 80 | 76 | 28 | 7 | | NP | 12 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-13 | WASH | 0-4.3 | SP | 100 | 98 | 90 | 85 | 66 | 16 | 3 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-13 | WASH | 4.3-10.4 | SP | | 100 | 99 | 96 | 81 | 30 | 4 | | NP | | SHELL FRAGMENTS ON # 10. |
| 70-13 | SPOON | 10.4-12.1 | SP/SM | 100 | 99 | 99 | 98 | 90 | 35 | 9 | | NP | 60+ | SHELL FRAGMENTS ON # 4. |
| 70-14 | SPOON | 0-3.5 | SP/SM | 99 | 96 | 87 | 63 | 49 | 25 | 9 | | NP | 6 | SHELL FRAGMENTS ON # 3/8. |
| 70-14 | WASH | 0-5.0 | SP | 100 | 97 | 88 | 60 | 40 | 14 | 2 | | NP | | |
| 70-14 | WASH | 5-8.6 | SP | 100 | 95 | 85 | 57 | 33 | 11 | 2 | | NP | | SHELL FRAGMENTS ON # 4. |
| 70-14 | SPOON | 7.1-8.6 | SP/SM | 100 | 96 | 93 | 90 | 66 | 26 | 8 | | NP | 53 | ROCK GRAVEL ON # 4. |
| 70-15 | SPOON | 0-5.5 | SM | 99 | 95 | 91 | 86 | 60 | 31 | 13 | | NP | 24 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-15 | WASH | 0-5.0 | SP | 100 | 98 | 94 | 87 | 81 | 29 | 4 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-16 | SPOON | 0-3.2 | SM | 100 | 98 | 93 | 82 | 65 | 36 | 18 | | NP | 6 | SHELL FRAGMENTS ON # 4, 10, 20, 30, 40. |
| 70-16 | WASH | 0-5.0 | SP | | 100 | 93 | 67 | 37 | 13 | 4 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20, 30, 40. |
| 70-17 | SPOON | 0-2.6 | SM | 100 | 96 | 88 | 81 | 77 | 51 | 18 | | NP | 17 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-17 | WASH | 0-6.2 | SP/SM | 100 | 96 | 90 | 85 | 78 | 49 | 5 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20, 30. |
| 70-17 | WASH | 6.2-10.8 | SM | | 100 | 99 | 96 | 86 | 70 | 15 | | NP | | |
| 70-17 | SPOON | 10.8-12.2 | CL | | | | 100 | 98 | 85 | 58 | 28 | 10 | 39 | |
| 70-18 | SPOON | 0-3.8 | SP/SM | | 100 | 96 | 86 | 75 | 42 | 10 | | NP | 24 | SHELL FRAGMENTS ON # 4, 10, 20, 30, 40. |
| 70-18 | WASH | 0-5.0 | SP/SM | | 100 | 95 | 88 | 82 | 58 | 6 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-19 | SPOON | 0-2.5 | CH | | | | | 100 | 91 | 62 | 51 | 26 | | |
| 70-19 | SPOON | 2.5-4.3 | SM | | 100 | 99 | 97 | 98 | 71 | 13 | | NP | 22 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-19 | WASH | 0-7.5 | SP/SM | | | | | 100 | 88 | 8 | | NP | | |
| 70-20A | SPOON | 0-1.5 | SM | 98 | 98 | 98 | 93 | 82 | 40 | 21 | | NP | 26 | SHELL FRAGMENTS ON # 3/8, 4. |
| 70-20A | WASH | 0-6 | SP/SM | | | 100 | 99 | 84 | 24 | 8 | | NP | | SHELL FRAGMENTS ON # 30. |
| 70-21 | SPOON | 0-5 | SC | | 100 | 99 | 92 | 80 | 59 | 41 | 30 | 9 | 11 | SHELL FRAGMENTS ON # 10, 20. |
| 70-21 | SPOON | 5-5.5 | GM | 54 | 52 | 50 | 43 | 31 | 22 | 17 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20, 30. |
| 70-21 | WASH | 0-5.5 | SC | | 100 | 97 | 91 | 78 | 56 | 38 | 37 | 17 | | SHELL FRAGMENTS ON # 4, 10. |
| 70-22 | SPOON | 0-1.5 | CH | 99 | 99 | 98 | 97 | 96 | 94 | 91 | 60 | 31 | 9 | |
| 70-22 | WASH | 0-5 | CL | | 100 | 98 | 87 | 79 | 74 | 69 | 42 | 17 | | |
| 70-23 | SPOON | 0-5.9 | CH | | | 100 | 99 | 99 | 97 | 88 | 96 | 64 | | |
| 70-23 | SPOON | 5.9-7.9 | SM | | | 100 | 98 | 95 | 57 | 37 | | NP | 7 | |
| 70-23 | WASH | 0-7.9 | CH | | 100 | 98 | 85 | 75 | 65 | 54 | 55 | 33 | | |
| 70-25 | SPOON | 0-1 | CH | | | | | 100 | 97 | 95 | 98 | 61 | | |
| 70-25 | SPOON | 1-2.5 | SP/SM | | | 100 | 98 | 94 | 77 | 12 | | NP | 15 | |
| 70-25 | WASH | 0-7 | SP/SM | 100 | 99 | 99 | 98 | 94 | 52 | 8 | | NP | | SHELL FRAGMENTS ON # 10. |
| 70-25 | WASH | 7-10 | SM | | 100 | 99 | 98 | 98 | 63 | 27 | | NP | | SHELL FRAGMENTS ON # 10. |
| 70-25 | SPOON | 10-11.5 | ML | 100 | 99 | 98 | 98 | 97 | 92 | 72 | 36 | 10 | 9 | |

Spoon sample at top of hole was offset 3± feet from location of test hole.
Spoon samples deeper in hole were secured through the cased hole.
Some individual spoon samples were separated into two samples.
For location and additional notes see drawings, "LOCATION AND TEST HOLE LOGS".

## TABLE I-2 (continued)

### NAVIGATION IMPROVEMENT SAN DIEGO HARBOR, CALIFORNIA
### COMPARISON OF SPOON AND WASH SAMPLES OF 1970

| HOLE NO. | TYPE SAMPLE | DEPTH | UNIF. SOIL CLASS. | PERCENT PASSING SIEVE SHOWN -3/8 | -4 | -10 | -20 | -60 | -100 | -200 | LL | PI | N | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70-26 | SPOON | 0-2.5 | SM | | 100 | 99 | 96 | 91 | 76 | 24 | | NP | 10 | |
| 70-26 | WASH | 0-8 | SP SM | 100 | 98 | 85 | 92 | 85 | 67 | 12 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-26 | SPOON | 23-24.5 | SM | 100 | 99 | 98 | 97 | 88 | 47 | 14 | | NP | 58 | SHELL FRAGMENTS ON # 4. |
| 70-26 | WASH | 23-29 | SP | | | 100 | 99 | 94 | 55 | 4 | | NP | | |
| 70-27 | SPOON | 20-21.5 | SP/SM | 97 | 94 | 89 | 86 | 80 | 58 | 12 | | NP | 33 | SHELL FRAGMENTS ON # 3/8, 4, 10. |
| 70-27 | WASH | 20-25 | SP | | 100 | 99 | 99 | 89 | 39 | 3 | | NP | | SHELL FRAGMENTS ON # 4, 10. |
| 70-28 | SPOON | 0-3.5 | SM | | 100 | 99 | 96 | 65 | 36 | 18 | | NP | 2 | SHELL FRAGMENTS ON # 4, 10. |
| 70-28 | WASH | 0-5 | SP/SM | 100 | 99 | 98 | 93 | 57 | 25 | 6 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-28 | SPOON | 20-21.5 | ML | | | 100 | 98 | 94 | 88 | 62 | | NP | 5 | SHELL FRAGMENTS ON # 20. |
| 70-28 | WASH | 20-25.5 | SM | | 100 | 99 | 93 | 89 | 81 | 50 | | NP | | SHELL FRAGMENTS ON # 10. |
| 70-28 | WASH | 28-35 | SP | 100 | 96 | 72 | 29 | 8 | 3 | 1 | | NP | | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-28 | SPOON | 35-35.5 | SP | 98 | 94 | 78 | 44 | 21 | 8 | 2 | | NP | | SHELL FRAGMENTS ON # 3/8, 4. |
| 70-28 | SPOON | 35.5-36.5 | SM | | 100 | 99 | 99 | 98 | 81 | 28 | | NP | 34 | SHELL FRAGMENTS ON # 10, 20. |
| 70-28 | WASH | 35.5-40.6 | SM | | 100 | 99 | 99 | 98 | 86 | 21 | | NP | | SHELL FRAGMENTS ON # 10, 20, 30. |
| 70-29 | SPOON | 0-2.0 | SM | 100 | 99 | 99 | 93 | 84 | 36 | 14 | | NP | 10 | SHELL FRAGMENTS ON # 4, 10. |
| 70-29 | WASH | 0-3.5 | SP/SM | | 100 | 98 | 89 | 49 | 27 | 10 | | NP | | SHELL FRAGMENTS ON # 4, 10. |
| 70-30 | SPOON | 0-3 | SM | 100 | 99 | 97 | 94 | 83 | 59 | 17 | | NP | 1 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-30 | WASH | 0-3.7 | SP | | 100 | 96 | 71 | 25 | 9 | 3 | | NP | | SHELL FRAGMENTS ON # 10, 20. |
| 70-30 | SPOON | 29.2-30.7 | SP/SM | 100 | 99 | 96 | 89 | 76 | 38 | 8 | | NP | 9 | SHELL FRAGMENTS ON # 4, 10, 20. |
| 70-30 | WASH | 24.8-29.2 | SP/SM | | | 100 | 98 | 83 | 52 | 12 | | NP | | SHELL FRAGMENTS ON # 20. |
| 70-31 | SPOON | 0-5.1 | SM | 99 | 98 | 97 | 96 | 94 | 84 | 40 | | NP | 4 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-31 | WASH | 0-4.4 | SM | 95 | 91 | 86 | 83 | 80 | 66 | 20 | | NP | | SHELL FRAGMENTS ON # 3/8, 4, 10. |
| 70-31 | WASH | 4.4-9.4 | SP/SM | | | 100 | 99 | 93 | 40 | 6 | | NP | | |
| 70-31 | SPOON | 30.4-31.9 | SW/SM | 80 | 66 | 45 | 29 | 22 | 18 | 12 | | NP | 25 | ROCK GRAVEL ON # 3/8, 4. |
| 70-31 | WASH | 30.4-33.1 | SP | | 100 | 98 | 61 | 17 | 4 | 1 | | NP | | |
| 70-32 | SPOON | 0-3.1 | SM | 98 | 96 | 94 | 90 | 73 | 52 | 20 | | NP | 9 | SHELL FRAGMENTS ON # 3/8, 4, 10, 20. |
| 70-32 | WASH | 0-4 | SM | 90 | 82 | 78 | 73 | 56 | 36 | 17 | | NP | | SHELL FRAGMENTS ON # 3/8, 4, 10. |
| 70-32 | SPOON | 30.5-32 | SM | | | 100 | 99 | 83 | 30 | 14 | | NP | 61 | |
| 70-32 | WASH | 28.5-36 | SP/SM | | | | 100 | 86 | 21 | 7 | | NP | | |

Spoon sample at top of hole was offset 3± feet from location of test hole.
Spoon samples deeper in the hole were secured through the cased hole.
Some individual spoon samples were separated into two samples.
For location and additional notes see drawings, "LOCATION AND TEST HOLE LOGS".

## TABLE I-3

## NAVIGATION IMPROVEMENT SAN DIEGO HARBOR, CALIFORNIA
## SEDIMENT ANALYSIS

| HOLE NO. | TYPE SAMPLE | ELEVATION BELOW MLLW (UNDIVIDED SAMPLE) FEET | MOISTURE PERCENT OF DRY WEIGHT | ANALYSIS REPORTED ON DRY WEIGHT BASIS | | | | | | OIL-GREASE PERCENT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | VOLATILE SOLIDS % | COD % | TOTAL KJELDAHL N-- | MERCURY HG $X10^{-4}$% | LEAD PB $X10^{-4}$% | ZINC ZN $X10^{-4}$% | |
| E1A | SURFACE | -41.8 | 24.5 | 1.2 | 0.26 | 0.011 | 0.03 | 9.7 | 35.3 | 0.01 |
| E1AD | SURFACE | -41.8 | 29.6 | 1.4 | 0.44 | 0.018 | 0.13 | 5.1 | 67.8* | 0.01 |
| E1B | SURFACE | -44.8 | 33.7 | 1.3 | 0.60 | 0.021 | 0.09 | 14.3 | 44.2 | 0.02 |
| E1BD | SURFACE | -44.8 | 30.8 | 1.3 | 0.35 | 0.013 | 0.02 | 7.9 | 21.0 | 0.01 |
| E1B | 1 | -44.8 TO -48.3 | 24.0 | 0.86 | 0.37 | 0.012 | 0.02 | 8.5 | 17.0 | 0.01 |
| E2A | SURFACE | -44.3 | 48.1 | 2.0 | 1.7 | 0.053 | 0.34 | 28.1 | 42.9 | 0.05 |
| E2AD | SURFACE | -44.3 | 34.4 | 1.4 | 0.89 | 0.029 | 1.1 * | 14.2 | 28.3 | 0.04 |
| E2B | SURFACE | -44.2 | 42.3 | 1.8 | 1.1 | 0.035 | 0.16 | 9.9 | 74.3* | 0.07 |
| E2BD | SURFACE | -44.2 | 42.9 | 1.7 | 1.2 | 0.041 | 0.18 | 15.5 | 39.4 | 0.08 |
| E3A | SURFACE | -40.5 | 102.5 | 6.7* | 7.1* | 0.202* | 0.93 | 83.0* | 22.7* | 0.48* |
| E3AD | SURFACE | -40.5 | 101.1 | 6.3* | 5.5* | 0.157* | 0.56 | 70.4* | 197.0* | 0.07 |
| E3AD | SURFACE | -40.5 | 52.9 | 3.4 | 2.4 | 0.084 | 0.24 | 52.1* | 131.0* | 0.15 |
| E3B | SURFACE | -41.4 | 72.2 | 5.0 | 4.8 | 0.125* | 0.44 | 47.6 | 177.0* | 0.25* |
| E3BD | SURFACE | -41.4 | 92.7 | 6.8* | 5.5* | 0.149 | 0.65 | 75.1* | 235.0* | 0.33* |
| E4A | SURFACE | -36.5 | 81.8 | 5.0 | 4.6 | 0.124* | 1.0 | 66.9* | 204.0* | 0.25* |
| E4AD | SURFACE | -36.5 | 96.6 | 5.6 | 5.5* | 0.155* | 0.98 | 66.7* | 220.0* | 0.21* |
| E4B | SURFACE | -36.0 | 82.4 | 5.7 | 5.2* | 0.125* | 1.3 * | 81.4* | 260.0* | 0.23* |
| E4BD | SURFACE | -36.0 | 83.3 | 5.4 | 6.1* | 0.148* | 1.4 * | 192.0* | 269.0* | 0.33* |
| E4B | 1 | -36.0 TO -37.3 | 72.6 | 5.7 | 5.8* | 0.146* | 1.7 * | 73.8* | 242.0* | 0.30* |
| E4B | 1 | -36.0 TO -37.3 | 54.2 | 5.0 | 4.5 | 0.095 | 1.7 * | 157.0* | 220.0* | 0.22* |
| E4B | 2 | -37.3 TO -39.6 | 29.1 | 1.9 | 0.40 | 0.016 | 0.55 | 21.9 | 30.0 | <.01 |
| E4B | 3 | -39.6 TO -42.1 | 21.7 | 0.66 | 0.18 | 0.004 | 0.44 | 2.4 | 11.9 | 0.2 |
| E4B | 3 | -39.6 TO -42.1 | 21.6 | 1.5 | 0.14 | 0.005 | 0.35 | 5.9 | 13.0 | 0.1 |
| E5A | SURFACE | -38.2 | 101.8 | 6.2* | 5.9* | 0.169* | VALUE MISSING | 87.4* | 200.0* | 0.20* |
| E5AD | SURFACE | -38.2 | 67.9 | 6.8* | 4.9 | 0.184* | 0.57 | 125.0* | 421.0* | 0.23* |
| E5B | SURFACE | -34.1 | 127.8 | 8.2* | 7.3* | 0.274* | 1.5 * | 111.0* | 220.0* | 0.32* |
| E5BD | SURFACE | -34.1 | 60.4 | 5.6 | 3.9 | 0.180* | 0.47 | 84.6* | 188.0* | 0.19* |
| E6A | SURFACE | -46.3 | 43.0 | 2.1 | 1.7 | 0.054 | 0.08 | 16.7 | 54.2* | 0.05 |
| E6AD | SURFACE | -46.3 | 32.0 | 1.6 | 0.62 | 0.020 | 0.16 | 12.9 | 24.4 | 0.03 |
| E6B | SURFACE | -36.2 | 78.8 | 4.4 | 5.3* | 0.166* | 0.55 | 71.3* | 155.0* | 0.29* |
| E6BD | SURFACE | -36.2 | 77.5 | 4.9 | 5.4* | 0.150* | 0.61 | 76.1* | 184.0* | 0.30* |
| E6B | 1 | -36.2 TO -38.8 | 57.6 | 3.5 | 3.4 | 0.087 | 0.53 | 48.3 | 160.0* | 0.20* |
| E6B | 1 | -36.2 TO -38.8 | 33.1 | 1.7 | 1.5 | 0.030 | 0.44 | 24.8 | 69.1* | 0.06 |
| E6B | 1 | -36.2 TO -38.8 | 31.6 | 2.4 | 0.84 | 0.025 | 0.38 | 43.1 | 32.2 | 0.02 |
| E6B | 2 | -38.8 TO -39.6 | 18.2 | 1.8 | 0.17 | 0.005 | 0.13 | 18.5 | 16.2 | 0.01 |
| E6B | 2 | -38.8 TO -39.6 | 23.6 | 2.8 | 0.21 | 0.007 | 0.07 | 29.2 | 17.0 | 0.04 |
| E6B | 3 | -39.6 TO -42.3 | 25.4 | 1.2 | 0.18 | 0.005 | 0.08 | 24.6 | 21.0 | 0.01 |
| E6B | 3 | -39.6 TO -42.3 | 21.9 | 2.0 | 0.15 | 0.005 | SBIK | 19.5 | 29.3 | 0.01 |
| E7A | SURFACE | -40.4 | 51.2 | 3.5 | 3.3 | 0.109* | 0.61 | 75.5* | 133.0* | 0.08 |
| E7AD | SURFACE | -40.4 | 47.9 | 2.6 | VALUE | MISSING | 0.44 | VALUE | MISSING | |
| E7B | SURFACE | -43.0 | 29.1 | 3.2 | 2.8 | 0.111* | 0.60 | 36.8 | 112.0* | 0.10 |
| E7BD | SURFACE | -43.0 | 51.7 | 4.5 | 3.5 | 0.165* | 0.48 | 39.0 | 126.0* | 0.17* |
| E8A | SURFACE | -32.1 | NO SAMPLE AT LABORATORY | | | | | | | |
| E8AD | SURFACE | -32.1 | 70.6 | 4.0 | 2.5 | 0.75 | 0.16 | 49.2 | 193.0* | 0.08 |
| E8B | SURFACE | -32.3 | 88.5 | 5.1 | 3.0 | 0.101* | 0.84 | 58.4* | 187.0* | 0.13 |
| E8BD | SURFACE | -32.3 | 41.0 | 4.3 | 2.1 | 0.074 | 0.33 | 37.8 | 130.0* | 0.13 |
| E8B | 1 | -32.3 TO -34.7 | 24.5 | 2.1 | 0.65 | 0.011 | 0.05 | 43.5 | 85.0* | 0.02 |
| E8B | 1 | -32.3 TO -34.7 | 20.0 | 2.0 | 0.14 | 0.009 | <.05 | 9.7 | 30.1 | |

## TABLE I-3 (continued)

## NAVIGATION IMPROVEMENT SAN DIEGO HARBOR, CALIFORNIA

## SEDIMENT ANALYSIS

| HOLE NO. | TYPE SAMPLE | ELEVATION BELOW MLLW (UNDIVIDED SAMPLE) FEET | MOISTURE PERCENT OF DRY WEIGHT | ANALYSIS REPORTED ON DRY WEIGHT BASIS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | VOLATILE SOLIDS % | COD % | TOTAL KJELDAHL N--% | MERCURY HG $X10^{-4}$% | LEAD PB $X10^{-4}$% | ZINC ZN $X10^{-4}$% | OIL-GREASE PERCENT |
| E8B | 2 | -34.7 TO -36.2 | 18.5 | 1.7 | 0.08 | 0.008 | <.05 | 2.4 | 54.1* | 0.01 |
| E8B | 2 | -34.7 TO -36.2 | 19.0 | 2.1 | 0.09 | 0.028 | <.05 | 7.1 | 41.6 | 0.01 |
| E8B | 2 | -34.7 TO -36.2 | 18.8 | 2.0 | 0.12 | 0.009 | 0.13 | 12.3 | 33.5 | <.01,<.01 |
| E8B | 3 | -36.2 TO -37.7 | 19.4 | 2.0 | 0.17 | 0.013 | 0.57 | 7.2 | 55.2* | |
| E8B | 3 | -36.2 TO -37.7 | 18.4 | 2.0 | 0.15 | 0.010 | 0.09 | 9.2 | 22.4 | |
| E8B | 3 | -36.2 TO -37.7 | 17.2 | 1.9 | 0.13 | 0.009 | 0.10 | 8.2 | 32.6 | |
| E8B | 4 | -37.7 TO -39.4 | 18.6 | 1.7 | 0.16 | 0.112* | 0.11 | 11.3 | 29.7 | |
| E8B | 4 | -37.7 TO -39.4 | 20.5 | 3.4 | 0.20 | 0.018 | 0.12 | 19.8 | 60.9* | |
| E8B | 5 | -39.4 TO -41.0 | 17.6 | 2.4 | 0.20 | 0.014 | <.05 | 12.4 | 56.7* | |
| E8B | 5 | -39.4 TO -41.0 | 19.3 | 2.9 | 0.18 | 0.012 | <.05 | 18.5 | 73.0* | |
| E8B | 5 | -39.4 TO -41.0 | 16.2 | 2.6 | 0.16 | 0.014 | <.05 | 21.6 | 69.8* | |
| E8B | 5 | -39.4 TO -41.0 | 17.9 | 2.8 | 0.16 | 0.015 | <.05 | 12.4 | 65.9* | |
| E8B | 5 | -39.4 TO -41.0 | 16.7 | 2.5 | 0.12 | 0.016 | 0.11 | 10.3 | 53.5* | 0.02 |
| E9A | SURFACE | -31.9 | 61.0 | 4.2 | 2.6 | 0.073 | 0.60 | 58.9* | 164.0* | 0.12 |
| E9AD | SURFACE | -31.9 | 48.2 | 2.7 | 2.1 | 0.077 | 0.55 | 47.7 | 123.0* | 0.10 |
| E9B | SURFACE | -31.9 | 79.4 | 5.4 | 4.3 | 0.015 | 0.55 | 53.1* | 164.0* | 0.32* |
| E9BD | SURFACE | -31.9 | 74.9 | 3.9 | 3.6 | VALUE MISSING | 0.42 | 49.0 | 164.0* | 0.21 |
| E9A | 1 | -31.9 TO -34.0 | 44.3 | 2.4 | 2.3 | 0.058 | 0.91 | 56.0* | 152.0* | 0.12 |
| E9A | 1 | -31.9 TO -34.0 | 0.4 | 1.4 | 1.5 | 0.034 | 0.15 | 36.0 | 122.0* | |
| E9A | 2 | -34.0 TO -36.3 | 1.1 | 3.4 | 0.20 | 0.015 | 0.06 | 13.1 | 66.4* | |
| E9A | 2 | -34.0 TO -36.3 | 0.8 | 2.9 | 0.18 | 0.014 | <.05 | 13.9 | 47.3 | |
| E10A | SURFACE | -33.4 | 75.6 | 4.1 | 3.2 | 0.086 | 0.52 | 52.1* | 132.0* | 0.05 |
| E10AD | SURFACE | -33.4 | 69.9 | 3.7 | 3.3 | 0.084 | 0.60 | 39.8 | 118.0* | 0.21* |
| E10B | SURFACE | -33.1 | 62.5 | 4.1 | 3.4 | 0.100 | 0.69 | 42.9 | 114.0* | 0.16* |
| E10BD | SURFACE | -33.1 | 67.1 | 3.7 | 3.1 | 0.118* | 0.50 | 33.0 | 85.7* | 0.14 |
| E11A | SURFACE | -38.9 | 107.4 | 8.3* | 6.3* | 0.145* | 1.2 * | 60.0* | 209.0* | 0.30* |
| E11AD | SURFACE | -38.9 | 121.5 | 7.4* | 8.3* | 0.199* | 1.5 * | 8[illegible].6* | 289.0* | 0.49* |
| E11B | SURFACE | -33.4 | 95.0 | 6.4* | 5.3* | VALUE MISSING | 1.8 * | 66.0* | 169.0* | 0.27* |
| E11BD | SURFACE | -33.4 | 92.6 | 6.3* | 6.5* | 0.157* | 0.95 | 77.3* | 209.0* | 0.37* |
| E12A | SURFACE | -30.5 | 108.2 | 6.6* | 6.5* | 0.137* | 0.96 | 51.3 | 187.0* | 0.20* |
| E12AD | SURFACE | -30.5 | 142.5 | 8.6* | 8.8* | 0.212* | 1.3 * | 82.8* | 300.0* | 0.46* |
| E12B | SURFACE | -33.7 | 82.3 | 5.3 | 4.7 | 0.111 | 0.44 | 46.4 | 150.0* | 0.23* |
| E12BD | SURFACE | -33.7 | 55.9 | 5.0 | 3.9 | 0.086 | 1.1 * | 53.7* | 140.0* | 0.19* |
| E13A | SURFACE | -28.2 | 118.6 | 7.6* | 6.3* | 0.134* | 0.78 | 50.1 | 185.0* | |
| E13AD | SURFACE | -28.2 | 99.2 | 7.7* | 4.6 | 0.103* | 0.54 | 51.3* | 166.0* | 0.13 |
| E13AD | SURFACE | -28.2 | 98.4 | 5.4 | 4.1 | 0.101* | 0.68 | 36.2 | 149.0* | 0.18* |
| E13B | SURFACE | -28.7 | 126.7 | 11.1* | 6.6* | 0.137* | 0.95 | 65.4* | 210.0* | 0.20* |
| E13A | 1 | -28.2 TO -31.0 | 99.1 | 6.2* | 5.1* | 0.116* | 0.56 | 51.1* | 156.0* | 0.12 |
| E13A | 1 | -28.2 TO -31.0 | 129.7 | 7.6* | 7.8* | 0.180* | 0.80 | 67.8* | 240.0* | 0.25* |
| E13A | 1 | -28.2 TO -31.0 | 138.3 | 9.3* | 10.6* | 0.[illegible]05* | 1.5 * | 94.5* | 373.0* | 0.44* |
| E13A | 2 | -31.0 TO -33.6 | 44.9 | 3.0 | 2.7 | 0.055 | 0.19 | 25.4 | 59.6* | 0.07 |
| E13A | 2 | -31.0 TO -33.6 | 25.6 | 1.5 | 0.78 | 0.014 | 0.09 | 12.2 | 17.0 | 0.01 |
| E13A | 3 | -33.6 TO -38.2 | 26.0 | 1.2 | 0.14 | 0.008 | <.05 | 2.5 | 13.9 | |
| E13A | 3 | -33.6 TO -38.2 | 21.0 | 1.3 | 0.28 | 0.007 | <.05 | 12.9 | 31.8 | 0.02 |
| E13A | 3 | -33.6 TO -38.2 | 0.5 | 2.5 | 0.33 | 0.012 | <.05 | 9.0 | 20.0 | <.01 |
| E14A | SURFACE | -32.5 | 39.8 | 1.7 | 0.83 | 0.015 | <.05 | NOT REPORTABLE | | 0.08 |
| E14AD | SURFACE | -32.5 | 96.9 | 5.6 | 3.0 | 0.088 | 0.38 | NOT REPORTABLE | | 0.10 |
| E14B | SURFACE | -34.2 | 49.0 | 2.4 | 1.4 | 0.030 | 0.26 | NOT REPORTABLE | | 0.06 |
| E14BD | SURFACE | -34.2 | 56.3 | 3.2 | 1.8 | 0.040 | 0.21 | NOT REPORTABLE | | .04, .14 |

## TABLE I-3 (continued)

## NAVIGATION IMPORVEMENT SAN DIEGO HARBOR, CALIFORNIA

## SEDIMENT ANALYSIS

| HOLE NO. | TYPE SAMPLE | ELEVATION BELOW MLLW (UNDIVIDED SAMPLE) FEET | MOISTURE PERCENT OF DRY WEIGHT | ANALYSIS REPORTED ON DRY WEIGHT BASIS: VOLATILE SOLIDS % | COD % | TOTAL KJELDAHL N--% | MERCURY HG $X10^{-4}$% | LEAD PB $X10^{-4}$% | ZINC ZN $X10^{-4}$% | OIL-GREASE PERCENT |
|---|---|---|---|---|---|---|---|---|---|---|
| E15A | SURFACE | -35.5 | 81 7 | 6.4* | 3.5 | 0 078 | 0.37 | 18 0 | 92 1* | 0 08 |
| E15AD | SURFACE | -35 5 | 89.0 | 5.8 | 2 7 | 0 064 | 0.26 | NOT REPORTABLE | | 0 09 |
| E15B | SURFACE | -37 0 | 112.0 | 6.3* | 4.4 | 0.109* | 0.92 | NOT REPORTABLE | | 0 25* |
| E15BD | SURFACE | -37 0 | 91.2 | 5.8 | 3.6 | 0.086 | 0.26 | 11.7 | 88 9* | 0.07 |
| E16A | SURFACE | -12 1 | 52.2 | 2.7 | 1.6 | 0.050 | 0.09 | NOT REPORTABLE | | 0.08 |
| E16AD | SURFACE | -12 1 | 67.3 | 3.8 | 2 0 | 0.055 | 0.26 | NOT REPORTABLE | | 0.06 |
| E16B | SURFACE | -12 3 | 134.4 | 7.8* | 4.4 | 0.110* | 0.45 | NOT REPORTABLE | | 0.18 |
| E16BD | SURFACE | -12.3 | 136.3 | 9.1* | 5 7* | 0.139* | 0.14 | NOT REPORTABLE | | .11 21* |
| E17A | SURFACE | -1 0 | 59.8 | 3.4 | 2.5 | 0 055 | 0.45 | 9.6 | 58.9* | 0.04 |
| E17AD | SURFACE | -1.0 | 48.6 | 2.7 | 2.0 | 0 048 | 0.57 | 10.1 | 66.3* | 0.06 |
| E17B | SURFACE | -0.4 | 50.4 | 2.9 | 2.5 | 0 047 | 0.59 | 9.0 | 47.7 | 0.02 |
| E17BD | SURFACE | -0.4 | 38.4 | 1.6 | 1 1 | 0 035 | 0.05 | 10.8 | 55.2* | 0.02 |
| E18A | SURFACE | -2.8 | 92.5 | 6.2* | 3 8 | 0 096 | 0.18 | NOT REPORTABLE | | 0.15 |
| E18AD | SURFACE | -2.8 | 109.0 | 7.4* | 5.2* | 0 102* | 0.22 | NOT REPORTABLE | | 0.11 |
| E18B | SURFACE | -2.6 | 182.6 | 9.7* | 6.1* | 0 137* | 0.28 | NOT REPORTABLE | | 0.11 |
| E18BD | SURFACE | -2.6 | 163.7 | 9.6* | 6 7* | 0 138* | 0.23 | NOT REPORTABLE | | .11, .09 |
| E18A | 1 | -2.8 TO -6 2 | 96.6 | 7.0* | 4.8 | 0 102* | 0.47 | 5.7 | 98.3* | 0.06 |
| E18A | 1 | -2.8 TO -6 2 | 57 1 | 4.6 | 3 4 | 0 095 | 0.37 | 1.0 | 83 0* | 0.05 |
| E18A | 1 | -2.8 TO -6.2 | 32.9 | 2.1 | 1.2 | 0 031 | 0.13 | 3.0 | 50.0 | 0.04 |
| E18A | 2 | -6.2 TO -9.2 | 39.1 | 3.0 | 2.2 | 0.033 | 1.1* | 7.0 | 39.0 | |
| E18A | 2 | -6.2 TO -9.2 | 44.7 | 4.7 | 3 8 | 0 060 | 0.18 | 10.9 | 79.1* | 0.01 |
| E18A | 3 | -9.2 TO -11.5 | 44.3 | 5.0 | 3.7 | 0.063 | 0.22 | 11.3 | 74 6* | 0.03 |
| E18A | 3 | -9.2 TO -11 5 | 38.8 | 3.2 | 1.7 | 0.049 | 0.10 | 4.6 | 72.7* | .02, .02 |
| E18A | 4 | -11.5 TO -14.9 | 39.7 | 3.4 | 1.6 | 0 048 | 0.16 | 9.1 | 71.3* | 0.02 |
| E18A | 4 | -11.5 TO -14 9 | 43.7 | 4.2 | 2.5 | 0 062 | 0.42 | 9 3 | 75.9* | 0.02 |
| E18A | 4 | -11.5 TO -14 9 | 48.0 | 5.5 | 3.2 | 0.079 | 0.37 | 5.2 | 93.4* | 0.02 |
| E18A | 5 | -14.9 TO -17.6 | 52.6 | 5.5 | 3.1 | 0.075 | <.05 | 5.8 | 58.9* | 0.01 |
| E18A | 5 | -14.9 TO -17.6 | 47.8 | 5.1 | 2.1 | 0.076 | <.05 | 9.9 | 82.1* | 0.02 |
| E18A | 5 | -14.9 TO -17 6 | 38.7 | 3.7 | 2.2 | 0.055 | 0 08 | 9.8 | 110.0* | .01, .07, .03 |
| E18A | 6 | -17.6 TO -20.3 | 53.3 | 7.5* | 4.3 | 0.114* | 0.19 | 16.9 | 118.0* | 0.02 |
| E18A | 6 | -17.6 TO -20.3 | 38.7 | 4.3 | 2.3 | 0.399* | 0.30 | 7.6 | 85.2* | 0.03 |
| E18A | 6 | -17.6 TO -20.3 | 41.8 | 5.3 | 3.3 | 0.081 | 0.39 | 12.8 | 98.1* | 0.04 |
| E18A | 7 | -20.3 TO -23.4 | 53.8 | 8.3* | 5 1* | 0 110* | 0.36 | 6.9 | 75.9* | 0.07 |
| E18A | 7 | -20.3 TO -23.4 | 40.4 | 3.9 | 2.6 | 0.066 | 0.05 | <1 | 39.1 | 0.03 |
| E18A | 7 | -20.3 TO -23.4 | 32.7 | 3.3 | 1 8 | 0.039 | <.05 | 8.4 | 41.9 | 0.03 |
| E18A | 8 | -23.4 TO -25.5 | 42.4 | 4.4 | 3.3 | 0.074 | <.05 | 6 0 | 58.4* | 0.02 |
| E18A | 8 | -23.4 TO -25.5 | 42.8 | 5.0 | 2.9 | 0.072 | < 05 | 10.9 | 101.0* | 0.01 |
| E18A | 8 | -23.4 TO -25.5 | 37.3 | 4.9 | 3.0 | 0.064 | 0.48 | 6.9 | 55.4* | 0.03 |
| E18A | 9 | -25.5 TO -28.2 | 49.2 | 6.1* | 6.0* | 0.089 | 0.16 | 4.9 | 94.0* | <.01 |
| E18A | 9 | -25.5 TO -28.2 | 45.4 | 8.4 | 4.0 | 0.102* | 0.33 | 15.6 | 57.8* | .04, .04 |
| E18A | 9 | -25 5 TO -28.2 | 39.8 | 5.2 | 3.8 | 0.074 | 0.22 | 2.9 | 53.4* | 0.03 |
| E18A | 10 | -28.2 TO -31.2 | 38.5 | 4.8 | 2.6 | 0 057 | <.05 | 20.2 | 95.9* | 0.01 |
| E18A | 10 | -28.2 TO -31.2 | 38.7 | 6.5* | 5.4* | 0 095 | 0.07 | 5.9 | 59.6* | <.01 |
| E18A | 10 | -28.2 TO -31.2 | 27.0 | 1.7 | 0.89 | 0.016 | 0.16 | 6.3 | 33.5 | 0.03 |
| E18A | 11 | -31.2 TO -34.1 | 39.1 | 2.2 | 0.43 | 0.015 | 0.38 | NOT REPORTABLE | | .01, .07, .10 |
| E18A | 11 | -31.2 TO -34.1 | 19.8 | 1.5 | 0.15 | 0.007 | <.05 | NOT REPORTABLE | | 0.04 |
| E18A | 11 | -31.2 TO -34.1 | 14.7 | 1.7 | 0.15 | 0.048 | 0.13 | 6.8 | 10.2 | 0.03 |

*Individual test result exceeds value indicated under "Criteria" Environmental Protection Agency Appendix "A" enclosed in letter dated 5 March 1971 From Basin Director, Water Quality Office to District Engineer LAD, C of E.

TABLE 1-4
**Results of Sea Water Analysis**

**EPA Laboratory**
**Alameda, California**

**Sample Received** ______________ **Transmittal Date** 1/28/72

| EPA Lab Number | Description | Copper Cu ug/ml | Cadmium Cd ug/ml | Chromium Cr ug/ml | Iron Fe ug/ml | Nickel Ni ug/ml | % Recovery | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Water | Steinhart Aquarium, Calif. Acad. of Sciences | .04 | .03 | .02 | .09 | .27 | -- | | | | |
| *Sea Water + | 1 mg/l spike | 100 % | 100% | 76.4% | 93.6% | 90.6% | → | Percent | Recovery | | |

**Explanation:** mg/l = ug/ml = ppm
*** Sea Water was filtered through 0.45 micron millipore filter.**

**Chemist Responsible** Mustafa M. Salma

TABLE 1-5
Sea Water - Sediment - Filtrate Analysis
"Water Column"

EPA Laboratory
Alameda, California

Sample Received —

Transmittal Date 1/28/72

| EPA Lab Number | Description | Copper Cu mg/l | Cadmium Cd mg/l | Chromium Cr mg/l | Iron Fe mg/l | Nickel Ni mg/l | Sediment weight added to 100 ml Sea Water | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 35FA121 | Sea Water - Sediment Filtrate | 0.0 | 0.0 | .01 | .01 | .02 | 20.342g | | | |
| 36FA121 | " | 0.0 | .01 | .01 | .05 | .03 | 21.086g | | | |
| 37FA121 | " | .05 | .07 | .02 | -- | .14 | 20.905g | | | |
| 38FA121 | " | 0.0 | .06 | .01 | 6.7 | .10 | 20.848g | | | |
| 39FA121 | " | 0.0 | .01 | .01 | .39 | .06 | 21.456g | | | |

Chemist Responsible Mustafa M. Saleng

TABLE 1-6
RESULTS OF SEDIMENT ANALYSIS

EPA Laboratory
Alameda, California

Sample Received 12/20/71 Transmittal Date 1/28/72

| EPA Lab Number | Corps of Engineers Description | Coll. Date | Moisture % | Copper Cu mg/Kg | Cadmium Cd mg/Kg | Chromium Cr mg/Kg | Iron Fe mg/Kg | Nickel Ni mg/Kg | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| * 35FA121 | San Diego Harbor E 1 -C | 12/16/71 | 23.1 | 7.9 | 0.37 | 7.4 | 4420 | 3.7 | | | |
| * 36FA121 | San Diego Harbor E 4 -C | 12/15/71 | 40.2 | 79.5 | 1.18 | 56.5 | 18669 | 16.7 | | | |
| * 37FA121 | San Diego Harbor E- 11 - C | 12/16/71 | 42.3 | 72.8 | 1.21 | 65.4 | 23228 | 22.5 | | | |
| * 38FA121 | San Diego Harbor E - 14 C | 12/16/71 | 40.7 | 30.2 | 0.25 | 37.3 | 21452 | 18.4 | | | |
| * 39FA121 | San Diego Harbor E 18 - C | 12/16/71 | 35.1 | 16.4 | 0.94 | 27.0 | 19456 | 21.1 | | | |
| | | Filtered Sediment Analysis | | | | | | | | | |
| ** 35FA121 | San Diego Harbor E 1 - C | 12/16/71 | 11.5 | 7.5 | 0.43 | 8.6 | 5082 | 4.3 | | | |
| ** 36FA121 | San Diego Harbor E 4 - C | 12/15/71 | 24.1 | 92.2 | 1.44 | 64.2 | 20492 | 17.5 | | | |
| ** 37FA121 | San Diego Harbor E 11 - C | 12/16/71 | 28.7 | 87.0 | 1.59 | 77.9 | 23401 | 22.1 | | | |
| ** 38FA121 | San Diego Harbor E - 14 C | 12/16/71 | 23.1 | 38.0 | 0.69 | 42.6 | 24512 | 19.3 | | | |
| ** 39FA121 | San Diego Harbor E 18 - C | 12/16/71 | 21.6 | 27.1 | 0.71 | 33.1 | 25938 | 17.7 | | | |
| | | | | | | | | | | | |

* Results of Sediments Analysis Before Extraction with Sea Water
** Results of Sediments Analysis After Extraction with Sea Water

Chemist Responsible Mustafa M. Salma

DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS

LABORATORY

# REPORT OF TESTS

# FOR

# POLLUTANTS IN BOTTOM SEDIMENT SAMPLES

# PROPOSED CHANNEL DEEPENING

# SAN DIEGO HARBOR, CALIFORNIA

SAUSALITO, CALIFORNIA

January 1972

REPORT OF TESTS
FOR
POLLUTANTS IN BOTTOM SEDIMENT SAMPLES

PROPOSED CHANNEL DEEPENING, SAN DIEGO HARBOR, CALIFORNIA

January 1972

## AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544 No. CIV-72-31, 8 December 1971, from the Los Angeles District.

## PURPOSE

2. The purpose of this study was to determine the quantities of specified pollutants in bottom sediment samples.

## SAMPLES

3. Thirteen grab samples, in glass jars, were received on 20 December 1971. Three of the samples (E 6-C, E 8-C and E 17-C) were taken with a Lauden Experimental sampler. The other samples were taken with an orange peel sampler.

## TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, zinc, iron, copper and chromium were run according to "Chemistry Laboratory Manual, Bottom Sediments" compiled by Great Lakes Region Committee on Analytical Methods and published by the Environmental Protection Agency, Federal Water Quality Administration, December 1969.

b. Mercury, Hatch and Ott Method using Coleman 50 Mercury Analyzer.

c. Lead, cadmium and nickel, Federal Water Pollution Control Administration (FWPCA) Atomic Absorption Methods, Nitric Acid Soluble. (Nov. 1969)

d. Arsenic, "Standard Methods for Examination of Water and Wastewater" 13th Edition 1971, Method 104A.

e. Total soluble phosphorus, Standard Methods 13th Ed. 223 2 b&c and 223 E 4d.

f. Settleability, Standard Methods, 13th Edition, 224 F 1a. As the samples were solid or semi-solid they were dispersed in San Diego Bay water prior to the test.

g. Pesticide Analysis, FWPCA, 1969.

h. Particle size, Engineer Manual EM 1110-2-1906.

TEST RESULTS

5. Test results are presented as follows:

a. Table 1 identifies the samples and shows the results of the chemical analyses. The ingredients are shown as percent of dry weight of the samples or as $1X10^{-4}$ percent (or parts per million) of dry weight.

1 part per million (ppm) = $1X10^{-4}$ percent
(1 ppm = 0.0001 percent)
1 percent = 10,000 ppm.

b. Table 2 shows the results of the settleability test made in Imhoff Cones.

c. Table 3 shows results of the tests for chlorinated hydrocarbon pesticides.

d. The visual classification sheet gives a brief description of each sample.

e. ENG Forms 2087 show gradation curves for the samples.

COMMENTS

6. The following comments are made:

a. All but one sample exceeded the EPA limit for zinc. Seven samples exceeded the limit for total Kjeldahl nitrogen. Four samples exceeded the limit for chemical oxygen demand (COD) and three samples exceeded the limit for oil and grease.

b. The two samples that were tested for pesticides showed only aroclor 1254 which is a polychlorinated biphenyl (PCB).

TABLE 1

January 1972

SAN DIEGO HARBOR - SAN DIEGO, CALIFORNIA
PROPOSED CHANNEL DEEPENING PROJECT

IDENTIFICATION AND CHEMICAL ANALYSES
OF
BOTTOM SAMPLES

| Lab. No. | Hole No. | Coordinates, Old Town (a) | | Depth, ft. Below MLLW | Moisture content % dry wt. | | Volatile Solids % dry wt. | C.O.D. % dry wt. | Total Kjeldahl Nitrogen % dry wt. | Oil and Grease % dry wt. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Total Sample | No. 10 Sieve (b) | | | | |
| PC-275 | E 2-C | S 13,600 | W 9,300 | 50.0 | 39.2 | 40.9 | 2.0 | 1.08 | 0.070 | 0.036 |
| PC-276 | E 3-C | S 12,800 | W 700 | 58.4 | 73.4 | 87.5 | 6.6* | 4.27 | 0.148* | 0.177* |
| PC-277 | E 5-C | S 15,300 | E 2,800 | 48.0 | 64.3 | 188.3 | 5.9 | 5.71* | 0.237* | 0.274* |
| PC-278 | E 6-C | S 17,500 | E 6,500 | 34.0 | 34.1 | 106.8 | 3.4 | 1.51 | 0.082 | 0.091 |
| PC-279 | E 7-C | S 18,900 | E 6,700 | 45.2 | 71.9 | 90.2 | 5.1 | 3.52 | 0.108* | 0.065 |
| PC-280 | E 8-C | S 20,200 | E 8,800 | 32.5 | 33.0 | 68.3 | 4.3 | 2.90 | 0.062 | 0.068 |
| PC-281 | E 9-C | S 22,600 | E10,500 | 37.5 | 57.9 | 63.2 | 4.1 | 2.70 | 0.115* | 0.113 |
| PC-282 | E10-C | S 23,900 | E12,200 | 34.4 | 64.5 | 65.2 | 4.1 | 2.93 | 0.105 | 0.096 |
| PC-283 | E12-C | S 27,400 | E16,800 | 33.6 | 124.1 | 127.1 | 8.2* | 6.04* | 0.183* | 0.259* |
| PC-284 | E13-C | S 29,600 | E18,500 | 37.0 | 60.6 | 62.5 | 4.2 | 2.62 | 0.085 | 0.067 |
| PC-285 | E15-C | S 34,700 | E19,500 | 40.8 | 142.2 | 146.5 | 8.5* | 5.43* | 0.125* | 0.074 |
| PC-286 | E16-C | S 37,000 | E19,000 | 16.6 | 147.5 | 150.5 | 9.0* | 6.36* | 0.138* | 0.046 |
| PC-287 | E17-C | S 39,000 | E20,100 | 2.2 | 37.4 | 42.4 | 1.4 | 0.62 | 0.024 | 0.009 |
| EPA Maximum Limits (Sept. 1971) | | | | | | | 6.0 | 5.0 | 0.10 | 0.15 |

(a) Old Town reference point. Navigational Chart 5107
(b) Chemical analyses were run on material passing the No. 10 sieve.
* Exceeds EPA limits.

January 1972

TABLE 1 (Continued)

SAN DIEGO HARBOR - SAN DIEGO, CALIFORNIA
PROPOSED CHANNEL DEEPENING PROJECT

IDENTIFICATION AND CHEMICAL ANALYSES
OF
BOTTOM SAMPLES

| Lab. No. | Hole No. | Iron Fe % dry wt. | Mercury Hg | Lead Pb | Zinc Zn | Cadmium Cd | Copper Cu | Chromium Cr | Arsenic As | Nickel Ni | Total Phosphorous P | Sulfide S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reported as $1 \times 10^{-4}$ percent of dry weight | | | | | | | | | |
| PC-275 | E 2-C | 1.31 | 0.33 | 10 | 62* | 0.4 | 20 | 14 | 0.387 | 2 | 185 | 79 |
| PC-276 | E 3-C | 3.13 | 0.50 | 21 | 112* | 1.1 | 66 | 37 | 0.141 | 10 | 370 | 441 |
| PC-277 | E 5-C | 3.95 | 0.84 | 43 | 176* | 1.5 | 84 | 55 | 0.525 | 10 | 596 | 743 |
| PC-278 | E 6-C | 1.65 | 0.08 | 23 | 87* | 0.8 | 50 | 21 | 0.358 | 5 | 306 | 62 |
| PC-279 | E 7-C | 2.45 | 0.33 | 23 | 114* | 1.0 | 53 | 32 | 0.392 | 8 | 290 | 584 |
| PC-280 | E 8-C | 1.53 | 0.76 | 30 | 74* | 0.7 | 32 | 19 | 0.392 | 4 | 240 | 279 |
| PC-281 | E 9-C | 3.31 | 0.48 | 21 | 129* | 0.8 | 67 | 41 | 0.458 | 3 | 288 | 91 |
| PC-282 | E10-C | 3.19 | 0.77 | 28 | 124* | 0.9 | 74 | 40 | 0.469 | 5 | 383 | 71 |
| PC-283 | E12-C | 5.36 | 0.68 | 28 | 204* | 1.2 | 123 | 68 | 0.652 | 7 | 542 | 259 |
| PC-284 | E13-C | 3.82 | 0.74 | 15 | 93* | 0.7 | 57 | 34 | 0.349 | 5 | 242 | 70 |
| PC-285 | E15-C | 8.60 | 0.30 | 21 | 113* | 1.1 | 76 | 54 | 0.500 | 9 | 426 | 47 |
| PC-286 | E16-C | 10.27 | 0.50 | 13 | 115* | 0.6 | 60 | 57 | 0.561 | 8 | 486 | 10 |
| PC-287 | E17-C | 1.59 | 0.82 | 6 | 47 | 0.3 | 13 | 17 | 0.558 | 1 | 212 | 26 |
| EPA Maximum Limits (Sept.1971) | | | 1.0 | 50 | 50 | - | - | | - | - | - | - |

*Exceeds EPA limits.

TABLE 2

January 1972

SAN DIEGO HARBOR - SAN DIEGO, CALIFORNIA
PROPOSED CHANNEL DEEPENING PROJECT

SETTLEABILITY

| Laboratory No. | Hole No. | Weight of Soil, grams (on dry loss) | Volume Settled, c.c. | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 Minute | 2 Minutes | 10 Minutes | 1 Hour | 2 Hours | 24 Hours |
| PC-275 | E 2-C | 300 | 250 | 195 | 195 | 200 | 220 | 380 |
| PC-276 | E 3-C | 300 | 150 | 100 | 155 | 255 | 295 | 560 |
| PC-277 | E 5-C | 300 | 130 | 220 | 250 | 265 | 305 | 500 |
| PC-278 | E 6-C | 300 | 390 | 360 | 360 | 390 | 395 | 395 |
| PC-279 | E 7-C | 258 | 215 | 230 | 235 | 290 | 435 | 440 |
| PC-280 | E 8-C | 250 | 270 | 250 | 255 | 295 | 325 | 325 |
| PC-281 | E 9-C | 300 | 200 | 150 | 190 | 200 | 240 | 485 |
| PC-282 | E10-C | 300 | 180 | 170 | 200 | 235 | 295 | 475 |
| PC-283 | E12-C | 250 | - | - | 210 | 295 | 390 | 640 |
| PC-284 | E13-C | 300 | - | - | 170 | 195 | 250 | 515 |
| PC-285 | E15-C | 215 | - | - | 210 | 275 | 325 | 820 |
| PC-286 | E16-C | 225 | - | - | 160 | 220 | 265 | 790 |
| PC-287 | E17-C | 220 | 190 | 160 | 200 | 210 | 215 | 220 |

Samples were dispersed and diluted to 1000 c.c. with San Diego Bay water. Settlement took place in 1000 c.c. Imhoff cones.

TABLE 3

SAN DIEGO HARBOR - SAN DIEGO, CALIFORNIA
PROPOSED CHANNEL DEEPENING PROJECT

CHLORINATED HYDROCARBON PESTICIDES
IN
BOTTOM SEDIMENT SAMPLES

| | | |
|---|---|---|
| Laboratory No. | PC-277 | PC-284 |
| Hole No. | E 5-C | E 13-C |
| Moisture Content, % dry wt. | 188.3 | 62.5 |
| Aroclor 1254 (a) | | |
| Parts per billion (ppb) of wet weight | 48 | 84 |
| Parts per billion on dry weight basis | 136 | 136 |

(a) aroclor 1254 is not a true pesticide but is a polychlorinated biphenyl (PCB).

No other pesticides were detected.

# VISUAL CLASSIFICATION — DISTURBED SAMPLES

District: Los Angeles Project: San Diego Harbor
Remarks: Jar Samples - Bottom Samples Sheet 1 of 2

| DIV. NO. | HOLE NO. | F.S. NO. | DEPTH | CLASSIFICATION |
|---|---|---|---|---|
| PC-275 | E 2-C | | -50.0 MLLW | Silty Sand (SM), dark gray, Sat. free water, fine grained, 30% NP fines, micaceous, shell fragments, odorous. |
| PC-276 | E 3-C | | -58.4 MLLW | Sandy Clay (CL), dark gray, wet, Sat, MP fines, considerable amount of fine sand, moderate amount of shell fragments. |
| PC-277 | E 5-C | | -48.0 MLLW | Sandy Clay (CL), dark gray, Sat. free water, MP fines, considerable amount of shell fragments, odorous. |
| PC-278 | E 6-C | | -34.0 MLLW | Mainly sea shells with a small amount silty sand soils, free water, odorous. |
| PC-279 | E 7-C | | -45.2 MLLW | Clayey Sand (SC), dark gray, sat. free water, fine grained, considerable amount of sea shells. |
| PC-280 | E 8-C | | -32.5 MLLW | Mainly sea shells with a small amount of silty sand soils, free water, odorous. |
| PC-281 | E 9-C | | -37.5 MLLW | Sandy Clay (CL), dark gray, sat, free water, MP fines, moderate amount of sea shells, odorous. |
| PC-282 | E10-C | | -34.4 MLLW | Same as above |
| PC-283 | E12-C | | -33.6 MLLW | Same as above |
| PC-284 | E13-C | | -37.0 MLLW | Same as above |
| PC-285 | E15-C | | -40.8 MLLW | Clay (CL), gray, Sat. free water, MP fines, trace of fine sand |

PLATE

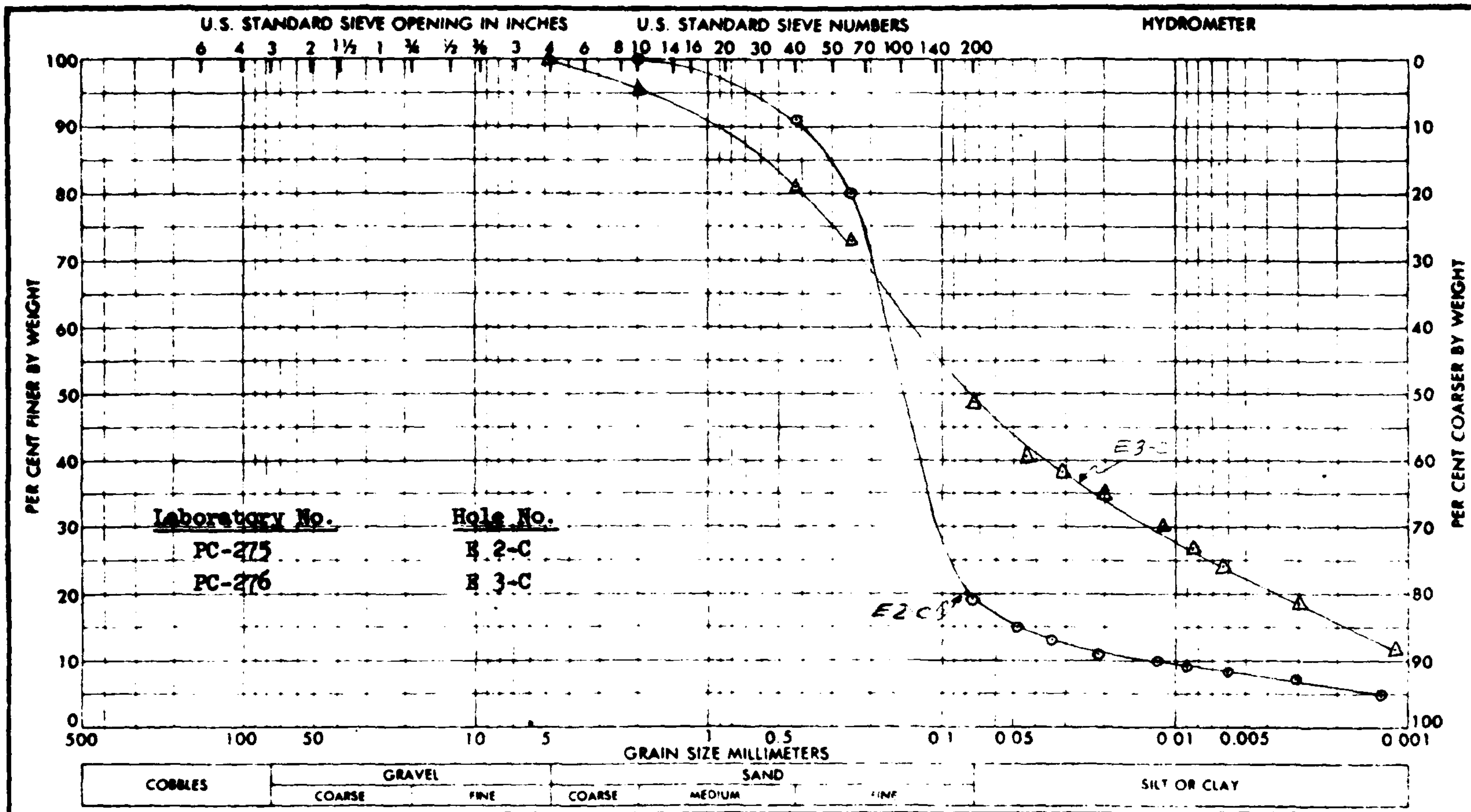
# VISUAL CLASSIFICATION — DISTURBED SAMPLES

District: Los Angeles Project: San Diego Harbor

Remarks: Jar Samples - Bottom Samples Sheet 2 of 2

| DIV. NO | HOLE NO. | FS NO. | DEPTH | CLASSIFICATION |
|---|---|---|---|---|
| PC 286 | E16-C | | -16.6 MLLW | Same as above |
| PC 287 | E17-C | | - 2.0 MLLW | Silty Sand (SM), dark gray, wet, Sat. fine grained, 10-15% NP fines, micaceous, odorous |

PLATE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E 2-C | -50.0MLLW | * Silty Sand (SM) | 39.2 | | | |
| E 3-C | -58.4MLLW | * Sandy Clay (CL) | 73.4 | | | |
| | | * Visual Classification | | | | |

**GRADATION CURVES**

PROJECT SAN DIEGO HARBOR
Bottom Samples

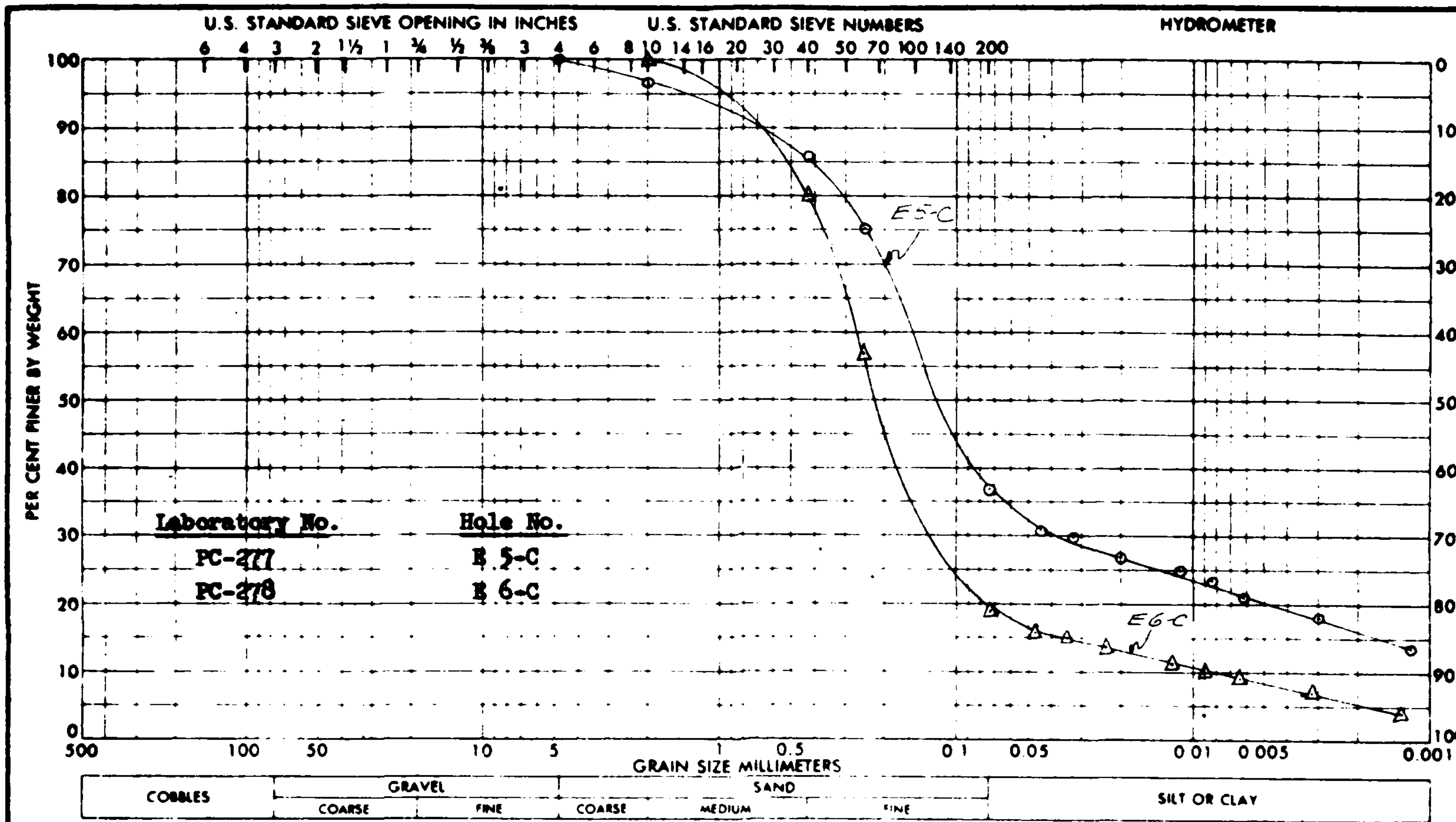
AREA

BORING NO E 2-C & E 3-C

DATE January 1972

ENG FORM 2087 1 MAY 63 REPLACES WES FORM NO 1241 SEP 1962 WHICH IS OBSOLETE

U.S. GOVERNMENT PRINTING OFFICE 1963 OF — 700-126




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E 5-C | -48.0 MLLW | *Sandy Clay (CL) | 64.3 | | | |
| E 6-C | -34.0 MLLW | * Mainly sea shells plus | 34.1 | with shells | | |
| | | small amount of Silty Sand | 87.5 | without shells | | |
| | | | | | | |
| | | * Visual Classification | | | | |

**GRADATION CURVES**

PROJECT SAN DIEGO HARBOR

Bottom Samples

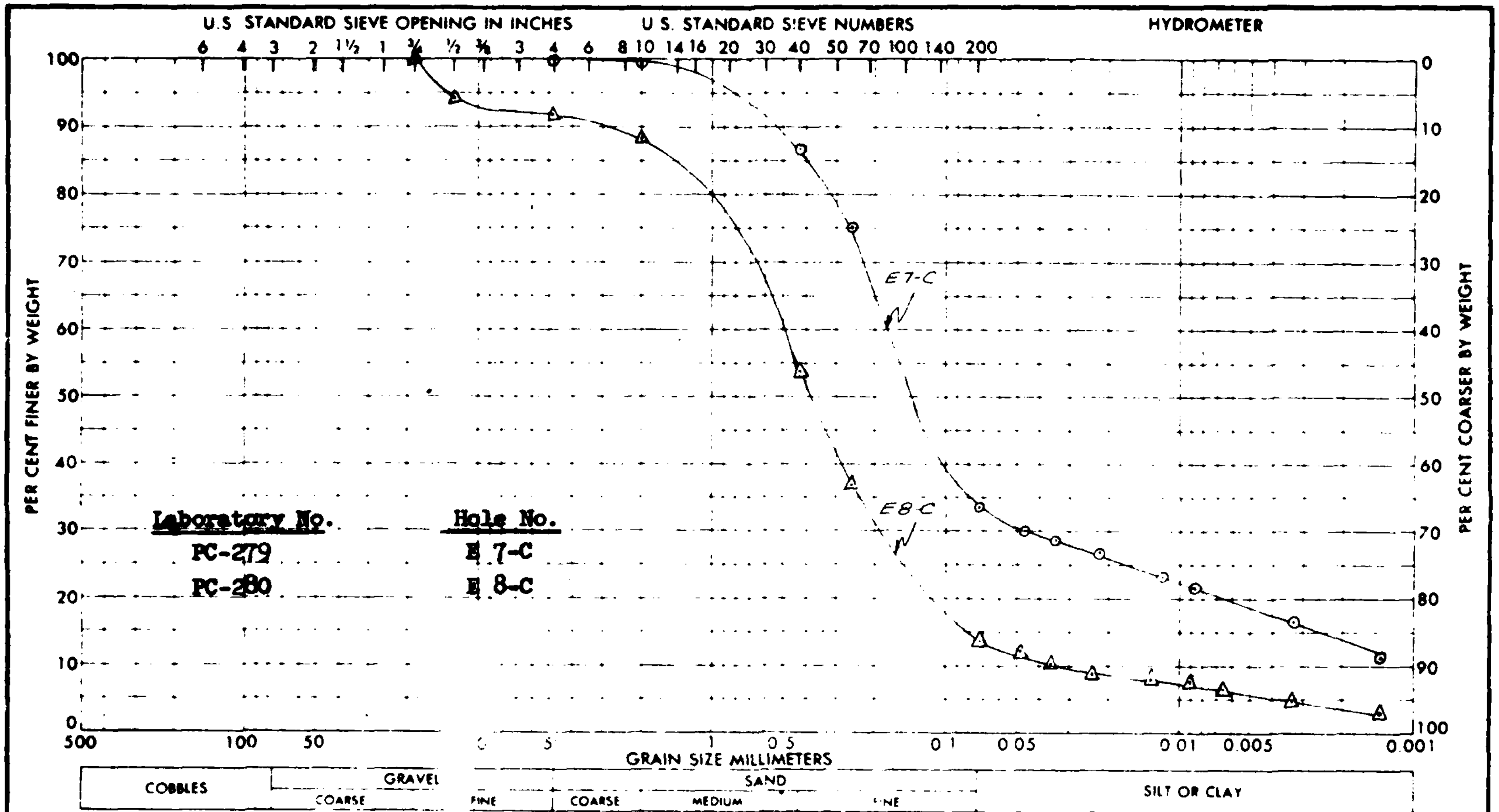
AREA

BORING NO. E 5-C & E 6-C

DATE January 1972

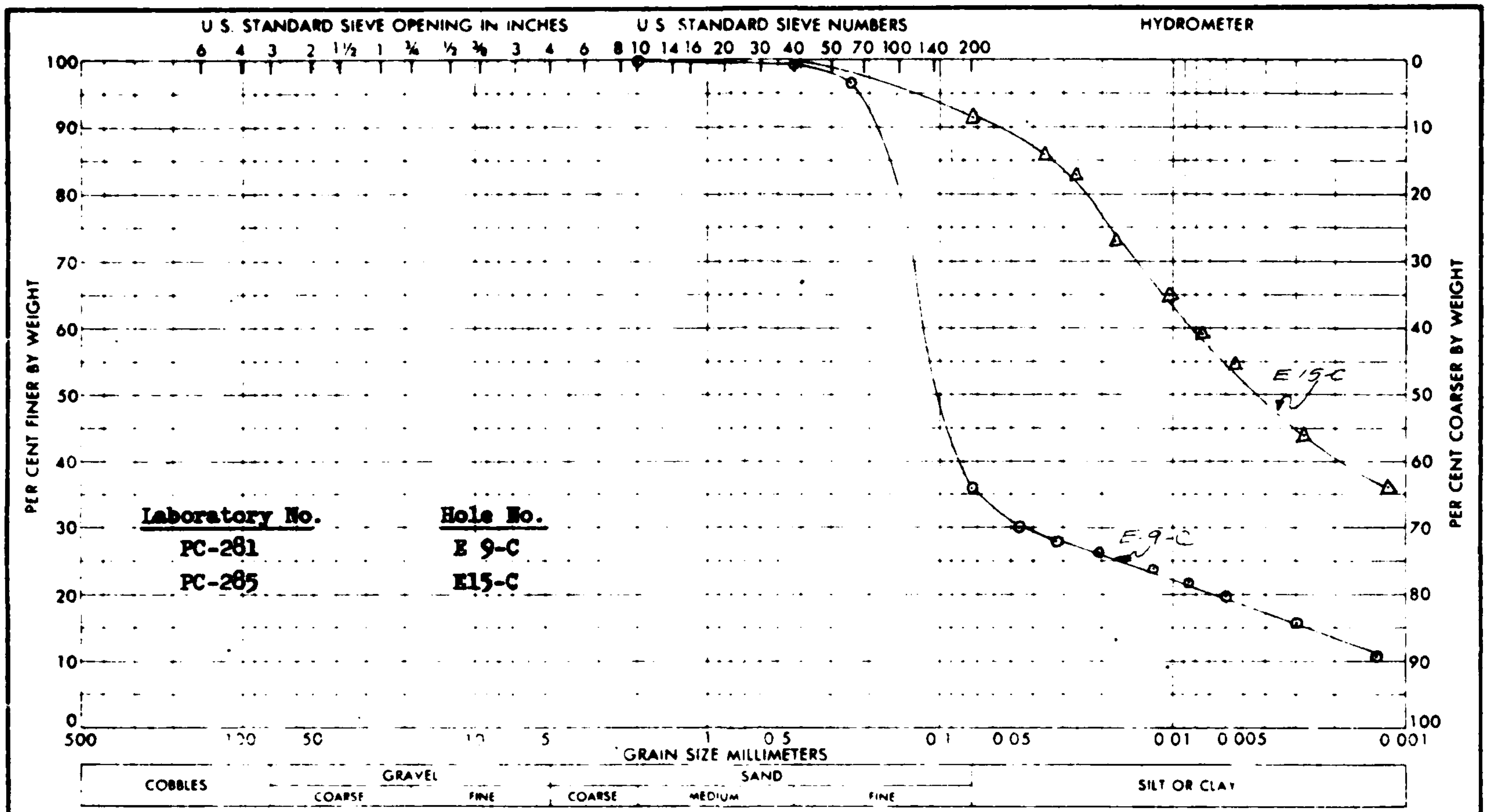
ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | | PROJECT | SAN DIEGO HARBOR |
|---|---|---|---|---|---|---|
| E 7-C | -45.2 MLLW | *Clayey Sand (SC) plus | 71.9 | with shells | | Bottom Samples |
| | | large quantity of sea shells | 93.6 | without shells | AREA | |
| E 8-C | -32.5 MLLW | * Mainly sea shells plus | 33.0 | with shells | | |
| | | small amount of Silty Sand | 61.4 | without shells | BORING NO | E 7-C & E 8-C |
| | | * Visual Classification | | | | |
| | | GRADATION CURVES | | | DATE | January 1972 |

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241 SEP 1962 WHICH IS OBSOLETE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E 9-C | -37.5 MLLW | * Sandy Clay (CL) | 57.9 | | | |
| E15-C | -40.8 MLLW | * Clay (CL) | 142.2 | | | |
| | | * Visual Classification | | | | |

**GRADATION CURVES**

| | |
|---|---|
| PROJECT | SAN DIEGO HARBOR |
| | Bottom Samples |
| AREA | |
| BORING NO | E 9-C & E 15-C |
| DATE | January 1972 |

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

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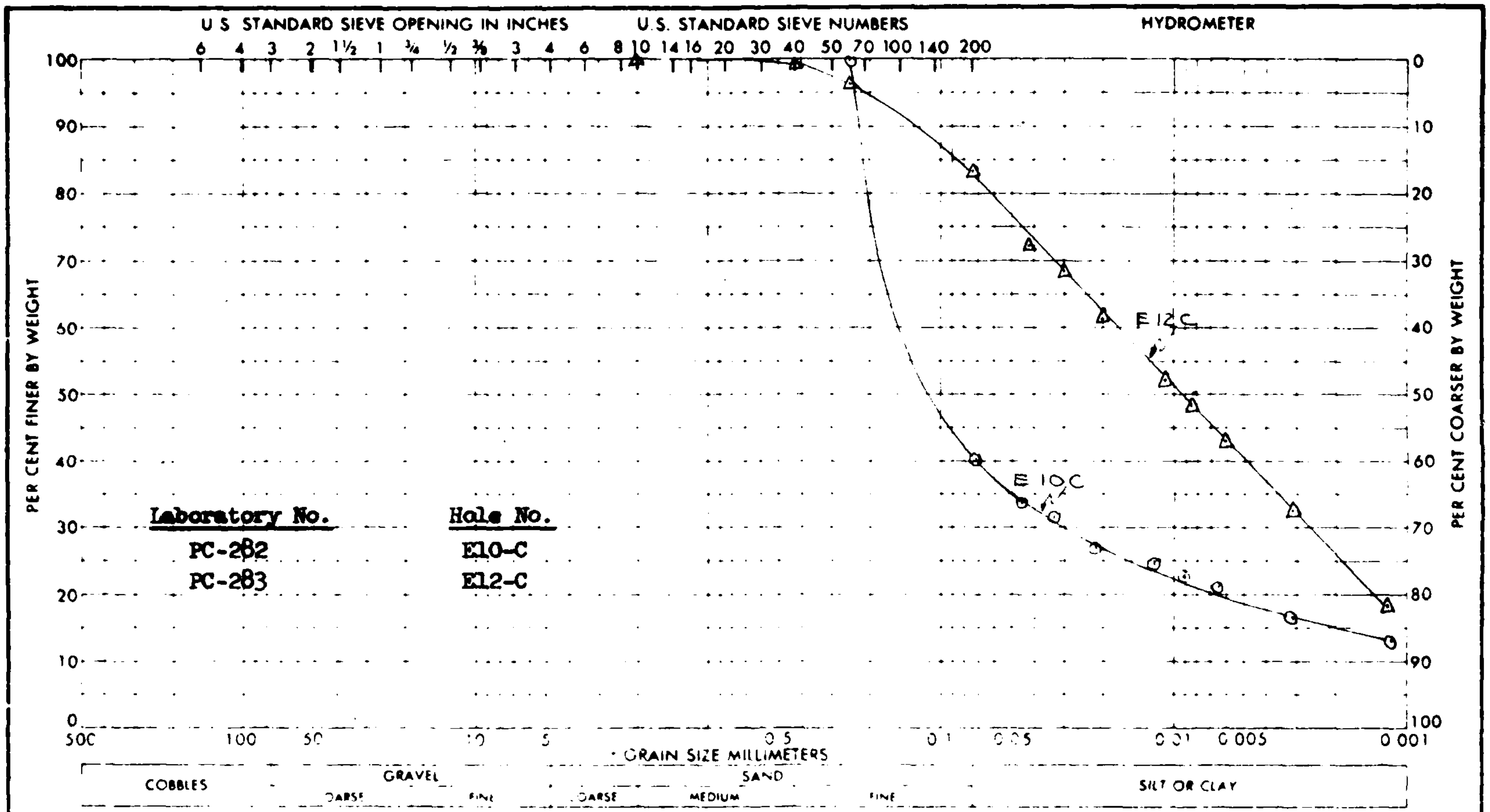



| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E10-C | -34.4 MLLW | * Sandy Clay (CL) | 64.5 | | | |
| E12-C | -33.6 MLLW | * Sandy Clay (CL) | 124.1 | | | |

* Visual Classification

GRADATION CURVES

PROJECT SAN DIEGO HARBOR

Bottom Samples

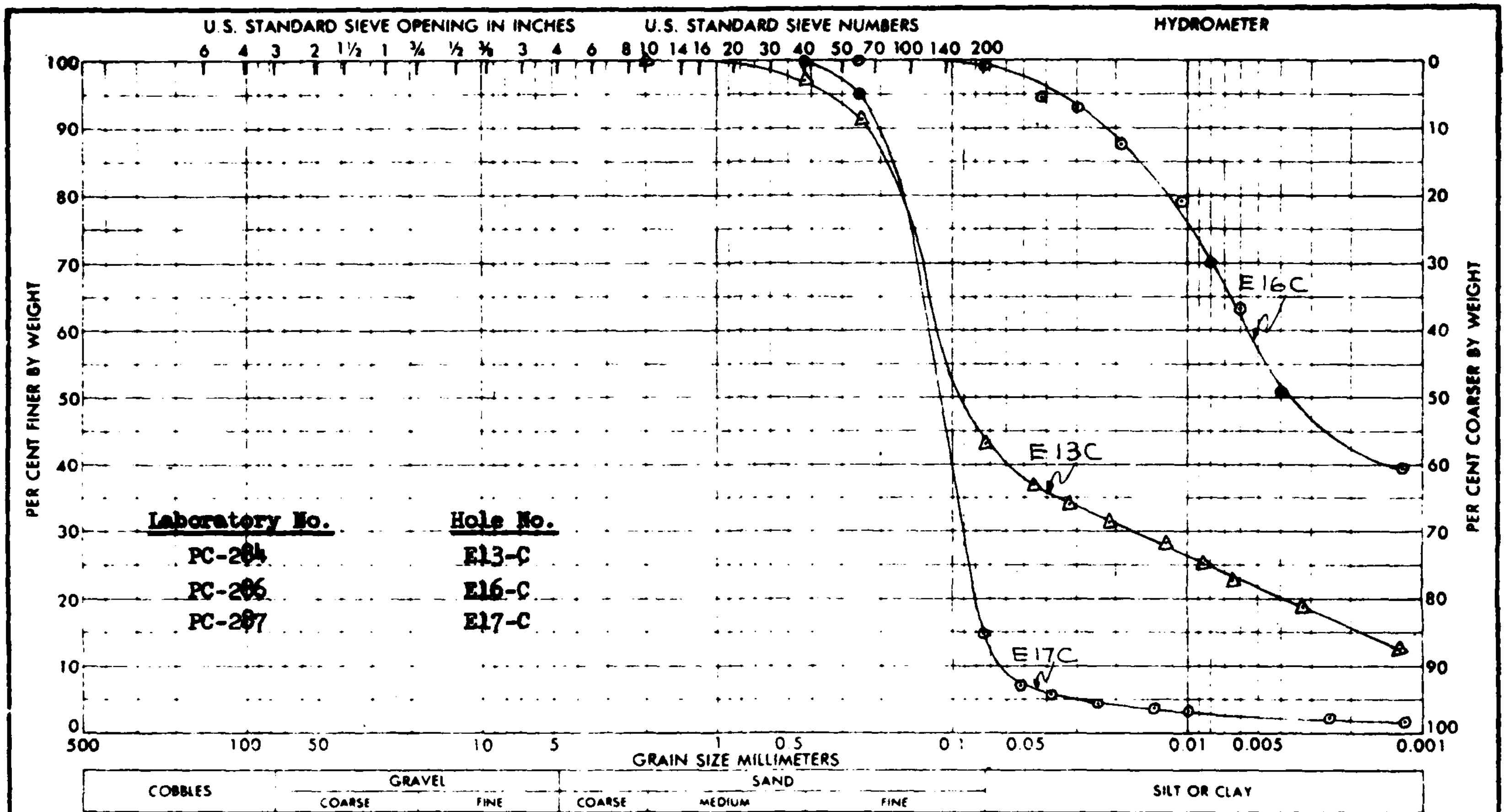
AREA

BORING NO. E10-C & E12-C

DATE January 1972

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E13-C | -37.0 MLLW | * Sandy Clay (CL) | 60.6 | | | |
| E16-C | -16.6 MLLW | * Clay (CL) | 147.5 | | | |
| E17-C | - 2.2 MLLW | * Silty Sand (SM) | 37.4 | | | |
| | | * Visual Classification | | | | |

GRADATION CURVES

PROJECT SAN DIEGO HARBOR
Bottom Samples

AREA

BORING NO E13-C, E16-C & E17-C

DATE January 1972

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO 1241 SEP 1962 WHICH IS OBSOLETE

U.S. GOVERNMENT PRINTING OFFICE

DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS

LABORATORY

# REPORT OF TESTS

# FOR

# POLLUTANTS IN SAND AND IN SILT OR CLAY FRACTIONS

# OF BOTTOM SEDIMENT SAMPLES

# PROPOSED CHANNEL DEEPENING

# SAN DIEGO HARBOR, CALIFORNIA

SAUSALITO, CALIFORNIA

February, 1972

REPORT OF TESTS

FOR

POLLUTANTS IN SAND AND IN SILT OR CLAY FRACTIONS
OF BOTTOM SEDIMENT SAMPLES
PROPOSED CHANNEL DEEPENING
SAN DIEGO HARBOR CALIFORNIA

February 1972

AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544 No. CIV-72-31, 8 December 1971, from the Los Angeles District.

PURPOSE

2. The purpose of this study was to determine the quantities of pollutants in the sand (plus 0.074 mm fraction) and in the silt or clay (minus 0.074 mm fraction) of bottom sediment sample E 5-C.

SAMPLES

3. Grab bottom sediment sample E 5-C was taken by a diver using an orange peel sampler. It was taken with twelve other samples, all in glass jars, and was received on 20 December 1971.

TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, zinc, iron, copper and chromium were run according to "Chemistry Laboratory Manual, Bottom Sediments" compiled by Great Lakes Region Committee on Analytical Methods and published by the Environmental Protection Agency, Federal Water Quality Administration, December 1969.

b. Mercury, Hatch and Ott Method using Coleman 50 Mercury Analyzer.

c. Lead, cadmium and nickel, Federal Water Pollution Control Administration (FWPCA) Atomic Absorption Methods, Nitric Acid Soluble. (Nov. 1969)

d. Arsenic, "Standard Methods for Examination of Water and Wastewater" 13th Edition 1971, Method 104A.

e. Total soluble phosphorus, Standard Methods 13th Ed. 223 2 b&c and 223 E 4d.

f. Particle size, Engineer Manual EM 1110-2-1906.

g. Fractional Grain-Size Separation. The sample was wet sieved in general accordance with Engineering Manual EM 1110-2-1906, Laboratory Soils Testing, 30 November 1970, using U.S. Standard No. 18, mesh, 1.0 mm opening and No. 200, mesh, 0.074 mm opening sieves. The sieves were constructed of stainless steel wire cloth, and the technician wore rubber gloves during the washing process as a precaution against contamination. Sea water from San Diego Harbor was used for washing and was applied to the material on each sieve by action of a battery filler type syringe. The material retained on the No. 18 sieve, consisting primarily of sea shells, was not tested. All wash water was collected in evaporating dishes and decanted after a period of settlement. All samples of the decanted wash water, the plus 0.074 mm, sand fraction and the minus 0.074 mm, silt or clay fraction were saved for pollution analysis.

## TEST RESULTS

5. Test results are presented as follows:

a. The table identifies the samples and shows the results of the chemical analyses. The ingredients are shown as percent of dry weight of the samples or as $1X10^{-4}$ percent (or parts per million) of dry weight. The water analysis results are shown in parts per million (ppm) and grams per liter (g/L).

1 part per million (ppm) = $1X10^{-4}$ percent
(1 ppm = 0.0001 percent)
1 percent = 10,000 ppm.

b. ENG Form 2087 shows gradation curves for the samples, and visual classification for each sample.

## COMMENTS

6. The following comments are made:

a. Pollutants in the silt or clay fraction exceeded EPA limits for volatile solids, C.O.D, total Kjeldahl nitrogen, oil and grease, mercury, lead, and zinc. The sand fraction exceeded EPA limits for mercury and zinc.

b. Mercury, lead and zinc in the sand and silt or clay fractions exceeded the amount of these heavy metals in the as received sample. This is attributed to the fact that the fractions were noticeably more soluble in the extraction fluid than the as received sample.

Also the values shown are for sand 100% and silt or clay 100%, however these fractions are 63% and 37% respectively of the as received sample.

c. Pollutants that were absorbed by the San Diego Bay water used to wash and process this bottom sample did not exceed EPA limits. This indicates, for this sample, that returning water with low turbidity from land spoil of this type of dredge discharge will probably not transport pollutants that exceed EPA limits to the receiving water.

d. It appears from this limited study (Fraction Analysis of one bottom sediment sample) that additional investigations of this type should be made to determine the relationship between pollutants, soil types and the ability of dredge spoil water to absorb and transport these pollutants.

**TABLE 1** February 1972

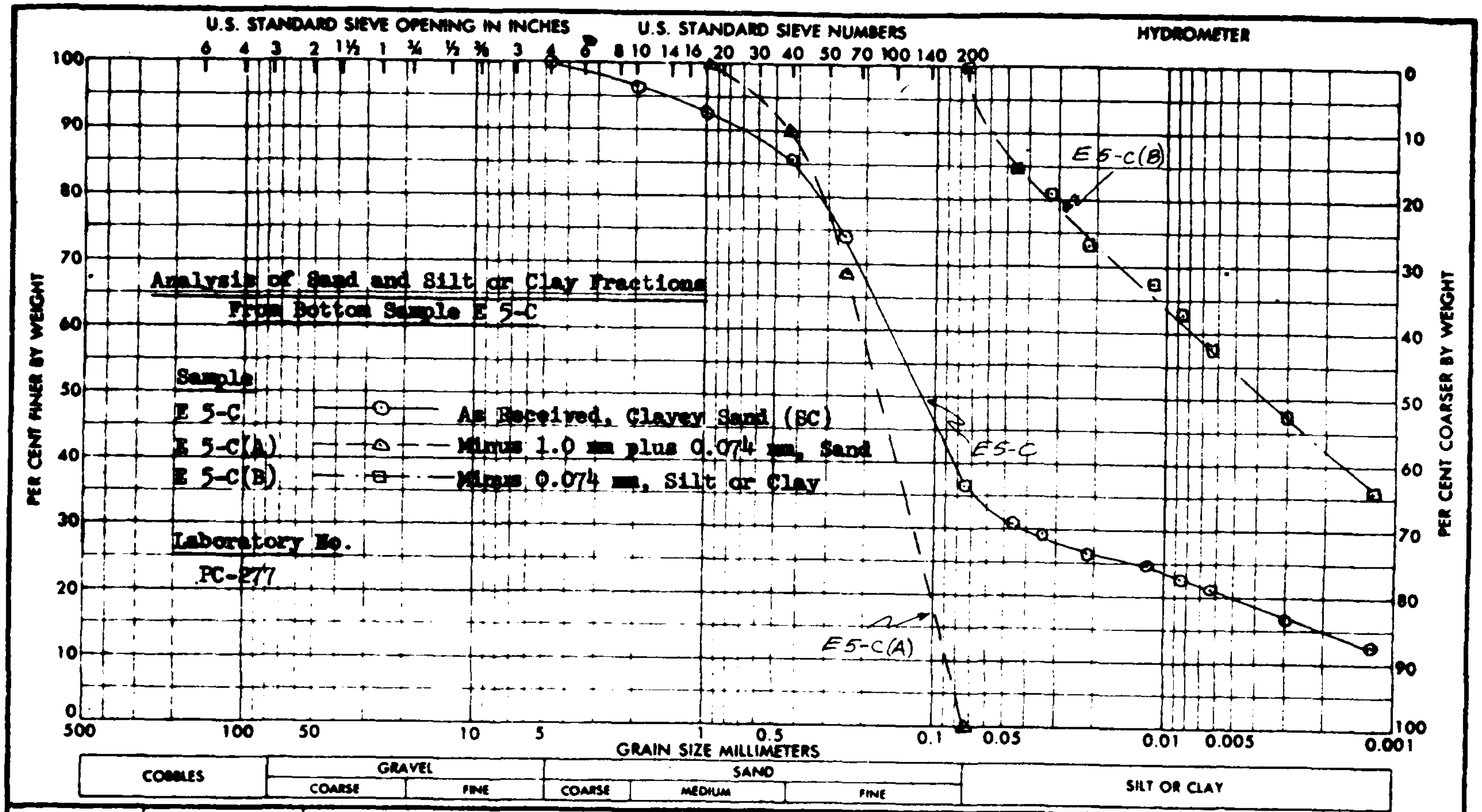
SAN DIEGO HARBOR-SAN DIEGO, CALIFORNIA

Proposed Channel Deepening Project
Identification and Chemical Analysis of Sand and Silt
or Clay Fractions of Bottom Sample No. E5-C, Depth 48.0 ft. Below MLLW
Coordinates, Old Town(a) S15,300 E2,800

| | | Soil Sample Fractions | | | | Water Samples | |
|---|---|---|---|---|---|---|---|
| | | As Received Sample E5-C | Sand Sample E5-C(A) +0.074 mm | Silt or Clay Sample E5-C(B) -0.074 mm | EPA Limits (Sept.1971) | Sample Washwater from San Diego Bay | As Received San Diego Bay Water |
| **Moisture Content** | | | | | | | |
| % of Dry Wt. | | 64.3 | 30.5 | 452.0 | - | - | - - |
| Total Solids | | - | - | - | - | 44.05 g/L | 40.73 g/L |
| Volatile Solids, % of Dry Wt. | | 5.9 | 2.1 | 12.6 * | 6.0 | 26.90% of Dry Wt.(b) | 18.98% of Dry Wt.(b) |
| C.O.D., % of Dry Wt. | | 5.7 * | 0.5 | 8.2 * | 5.0 | 2117 ppm | 17 ppm |
| Total Kjeldahl Nitrogen, % of Dry Wt. | | 0.24* | 0.04 | 0.42* | 0.10 | 162 ppm | 16 ppm |
| Oil and Grease, % of Dry Wt. | | 0.27* | 0.05 | 0.46* | 0.15 | 33 ppm | 19 ppm |
| Iron, Fe, % of Dry Wt. | | 3.95 | 0.63 | 2.48 | - | 1 ppm | 1 ppm |
| **Reported as $1X10^{-4}$ % Dry Wt.** | | | | | | Reported as ppm | |
| Mercury | Hg | 0.84 | 1.13* | 1.84* | 1.0 | 0.009 | 0.009 |
| Lead | Pb | 43 | 46 | 110 * | 50 | 0.04 | 0.04 |
| Zinc | Zn | 176 * | 98 * | 210 * | 50 | 0.03 | 0.02 |
| Cadmium | Cd | 1.5 | 3.2 | 8.3 | - | < 0.005 | < 0.005 |
| Copper | Cu | 84 | 1.8 | 7.2 | - | 0.01 | 0.01 |
| Chromium | Cr | 55 | 9.8 | 74.5 | - | < 0.2 | < 0.2 |
| Arsenic | As | 0.525 | 0.16 | 2.87 | - | 0.001 | 0.005 |
| Nickel | Ni | 10 | 4.6 | 28 | - | 0.03 | 0.03 |
| Total Phosphorous | P | 596 | 123 | 608 | - | 0.7 | 0.07 |
| Sulfide | S | 743 | 11 | 392 | - | <0.04 | <0.04 |

* Exceeds EPA limits (Sept. 1971)
(a) Old Town reference point. Navigational Chart 5107
(b) Including water of Hydration of Sodium Chloride

NOTE: The Soil Sample Fractions are shown as % of dry weight or as $1X10^{-4}$ % (or parts per million) of dry weight
1 ppm = $1X10^{-4}$ %
(1 ppm = 0.0001 %)
1 % = 10,000 ppm
The water analysis results are shown in parts per million (ppm) and in grams per liter (g/L)




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E 5-C | -48.0 MLLW | *As Rec'd. Clayey Sand (SC) | 64.3 | | | |
| E 5-C(A) | " " | *Minus 1.0 mm plus 0.074 mm, Sand Fraction | | | | |
| E 5-C(B) | " " | *Minus 0.074 mm, Silt or Clay Fraction | | | | |
| | Note: | *Visual Classification | | | | |

PROJECT SAN DIEGO HARBOR
BOTTOM SAMPLE
AREA Fraction Analysis
BORING NO E 5-C
DATE February 1972

GRADATION CURVES

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE

DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS

LABORATORY

# POLLUTION STUDY

# FOR

# PROPOSED CHANNEL DEEPENING

# SAN DIEGO HARBOR, CALIFORNIA

SAUSALITO, CALIFORNIA

June 1972

SAN DIEGO HARBOR

POLLUTION STUDY
FOR
PROPOSED CHANNEL DEEPENING

## AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544, No. CIV-72-57, 29 February 1972, from the Los Angeles District.

## PURPOSE AND SCOPE

2. The purpose of this study was to determine the quantities and the distribution of pollutants in five core samples from sediments in San Diego Harbor. The tests required were outlined in a memorandum from M. P. Wennekens, Ph.D. Oceanographer, Coastal Engr. Branch, SPD, to Major W. Worthington, Engr. Div., Los Angeles District, subject: "Bottom Cores, San Diego Harbor, Recommended Analysis."

## SAMPLES

3. Five core samples in 2¼-inch diameter plastic tubes were received on 25 January 1972. Samples were obtained by using pneumatic tools, floating equipment and hard hat divers. Locations of the sample holes are shown in Table 1.

## TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, iron, lead, zinc, copper, cadmium, chromium and nickel were determined according to "Chemistry Laboratory Manual, Bottom Sediments" compiled by Great Lakes Region Committee on Analytical Methods and published by the Environmental Protection Agency (EPA), Federal Water Quality Administration, December 1969.

b. Mercury, Hatch and Ott Method using a Coleman 50 Mercury Analyzer.

c. Arsenic, Method 104A of "Standard Methods for Examination of Water and Wastewater," 13th Edition 1971, published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation.

d. Total phosphorus, Standard Methods, 13th Ed., Method 223E.

e. Sulfide, Standard Methods, 13th Edition, Method 228B.

f. Pesticide analysis, Federal Water Pollution Control Administration, 1969.

g. Particle size, Engineer Manual EM 1110-2-1906.

h. Separation of samples by sedementation; about 3/4 pint of soil was placed in a 1000 ml beaker which was then filled with Steinhart Aquarium sea water. After stirring, the sand was allowed to settle and the suspension poured into an evaporating dish. The beaker was again filled with water and the process repeated until the water was clear after stirring. After flocculation occurred, the clear water was removed from the evaporating dish.

i. Rate of Settling

Two 1000 ml soil Steinhart Aquarium sea water suspensions were prepared using 20 and 40% soil by weight. The 20% suspension was 8.6% soil by volume and the total density was 13.8 lbs/cu.ft. The 40% suspension was 20.0% soil by volume and the total density was 32.2 lbs/cu.ft. The soil was dispersed and allowed to settle with periodic measurements taken from the surface of the water to the surface of the flocculated soil.

## TEST RESULTS

5. Data are presented as follows:

a. Table 1 shows location of samples.

b. Table 2 shows the results of analysis of the samples from core E11E. The ingredients are shown as percent of dry weight of the samples, as $1X10^{-4}$ percent (or parts per million) of dry weight or as parts per billion ($1X10^{-7}$ percent) of dry weight.

1 part per million (ppm) = $1X10^{-4}$ percent or 1 ppm = 0.0001 percent.
1 percent = 10,000 ppm
1 part per billion (ppb) = $1X10^{-7}$ percent
1 percent = 10,000,000 ppb

c. Table 3 shows the results of analysis of samples from core E1E and core E5E.

d. Table 4 shows the results of analysis of samples from core E6E and core E16E.

e. ENG Forms 2087 (Plate 1-6) show gradation curves and visual classifications for various samples.

f. Plate 7 shows results of a settling test.

g. The Field Log Sheets identify the holes from which the samples were taken and give a brief description of the samples.

h. Plates 8 and 9 show colored photographs of the cores after the tubes were split.

COMMENTS

6. The following comments are made:

a. The homogenized whole sample of core E11E exceeded EPA limits for zinc. The separated flock portion of this sample exceeded the maximum limits for the seven constituents limited by EPA (volatile solids, C.O.D., Kjeldahl nitrogen, oil and grease, mercury, lead and zinc). The flock from the 16½ to 18½ inch depth exceeded the limits for volatile solids, C.O.D. and zinc. The minus No. 200 sieve material from 42 to 44½ inch depth exceeded the limits for volatile solids, Kjeldahl nitrogen and zinc.

b. All minus No. 200 sieve samples from cores E1E, E5E (Table 3, Plates 3, 4) and E6E (Table 4, Plate 5) exceeded EPA limits for the seven EPA basic constituents.

c. The minus No. 200 sieve material from 0-4 inch depth material from core E16E (Table 4, Plate 6) exceeded the limits for volatile solids, C.O.D., Kjeldahl nitrogen, mercury and zinc. Minus No. 200 sieve material from 13½ to 17 inch depth of core E16E (Table 4, Plate 6) exceeded limits for volatile solids and zinc.

d. Test results indicate that the finer portions of the samples contained the greatest quantities of pollutants.

e. Tests for chlorinated hydrocarbon pesticides and for polychlorinated biphenyls (PCB) were not considered accurate due to contamination and interference from the plastic tubes used to obtain the samples. The PCB material is reported for core E11E to show distribution with grain size but actual results are not considered accurate.

f. It was determined from a settling test conducted on a homogenized sample from core E11E that approximately 2 to 2½ hours were required to complete sedimentation (see Plate 7). The increase in water depth after that time is due to consolidation of the soil. Flocculation occurred within 30 seconds after dispersion. The sand settled in about 15 seconds. The 20% soil suspension settled at the rate of 3 inches per hour and the 40% at 1 inch per hour; however total settling times, 2 to 2½ hours, were about the same for both suspensions.

TABLE 1

SAN DIEGO HARBOR POLLUTION STUDY

LOCATION OF SAMPLES

| Hole No. | Location | | Ground Elevation, M.L.L.W. | Depth of Hole, ft. | Core Recovered, ft. | Date Drilled |
|---|---|---|---|---|---|---|
| E 1E | S20,100 | W13,750 | -42.2 | 2.2 | 2.2 | 22 Jan 72 |
| E 5E | S15,700 | E 3,350 | -37.0 | 3.0 | 2.3 | 22 Jan 72 |
| E 6E | S17,425 | E 6,425 | -36.2 | 4.2 | 4.2 | 23 Jan 72 |
| E11E | S26,800 | E15,925 | -31.9 | 4.0 | 3.6 | 23 Jan 72 |
| E16E | S36,700 | E19,750 | -30.7 | 5.0 | 3.6 | 23 Jan 72 |

TABLE 2

SAN DIEGO HARBOR POLLUTION STUDY

ANALYSIS OF CORE ELLE

| Laboratory No. | PC-349 Homogenized | PC-395 | PC-396 | PC-397 | PC-398 | PC-399 | PC-400 | PC-391 | PC-392 | PC-401 | PC-402 | EPA Max. Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of sample | Whole | (a) Sand | (a) Flock | (a) Sand | (a) Flock | (a) Sand | (a) Flock | Whole | Whole | Sieved(c) | Sieved(c) | |
| Particle size | -#10 Sieve | | | | | | | -#10 sieve | -#10 sieve | -#10,+#200 | -#200 | |
| Depth, inches | 0-44½ | 0-44½ | 0-44½ | 0-4 | 0-4 | 16½-18½ | 16½-18½ | 22-25 | 38½-40½ | 42-44½ | 42-44½ | |
| Moisture content, % dry wt. | 27.9 | 20.1 | 193.5 | 32.7 | 195.9 | 26.9 | 217.9 | 15.8 | 14.7 | 25.0 | 120.9 | |
| Volatile Solids, % dry wt. | 2.5 | 0.8 | 8.6 * | 1.3 | 8.9 * | 2.4 | 9.6 * | 1.8 | 1.5 | 0.8 | 6.1 * | 6.0 |
| Chemical oxygen demand (COD), % dry wt. | 1.4 | 0.1 | 6.1 * | 0.8 | 8.2 * | 0.3 | 5.1 * | 0.1 | 0.1 | 0.1 | 0.3 | 5.0 |
| Total Kjeldahl nitrogen, % dry wt. | 0.04 | 0.01 | 0.14* | 0.02 | 0.16* | 0.05 | 0.10 | 0.02 | 0.01 | 0.00 | 0.18* | 0.10 |
| Oil and grease, % dry wt. | 0.04 | 0.03 | 0.27* | (b) | 0.46* | (b) | 0.10 | 0.02 | 0.02 | (b) | 0.03 | 0.15 |
| Iron (Fe), % dry wt. | 1.6 | 2.2 | 5.3 | (b) | 5.3 | 1.7 | 5.4 | 1.5 | 1.8 | 1.4 | 4.4 | - |
| **Heavy Metals** | | | | | | | | | | | | |
| Mercury (Hg), 1X10$^{-4}$ % dry wt. | 0.9 | 0.2 | 1.1 * | 0.6 | 1.4 * | 0.1 | 0.5 | 0.3 | 0.2 | 0.1 | 0.6 | 1.0 |
| Lead (Pb) " " " | 20 | 12 | 59 * | (b) | 71 * | 10 | 25 | 5 | 7 | 5 | 44 | 50 |
| Zinc (Zn) " " " | 74 * | 31 | 220 * | (b) | 248 * | 18 | 70 * | 16 | 8 | 6 | 71 * | 50 |
| Cadmium (Cd) " " " | 0.8 | 0.2 | 2.3 | (b) | 3.0 | 0.1 | 1.3 | 0.1 | 0.2 | 0.2 | 0.9 | - |
| Copper (Cu) " " " | 41 | 18 | 82 | (b) | 118 | 6 | 32 | 9 | 6 | 4 | 51 | - |
| Chromium (Cr) " " " | 26 | 17 | 71 | (b) | 83 | 18 | 70 | 12 | 25 | 22 | 80 | - |
| Arsenic (As) " " " | 0.7 | 0.1 | 3.3 | (b) | 5.2 | 0.2 | 2.5 | 0.2 | 0.1 | 0.1 | 0.6 | - |
| Nickel (Ni) " " " | 31 | 8 | 38 | (b) | 44 | 11 | 35 | 10 | 9 | 10 | 9 | - |
| Total phosphorus (P), 1X10$^{-4}$ % dry wt. | 126 | 65 | 363 | (b) | 490 | 119 | 411 | 51 | 34 | 18 | 97 | - |
| Sulfide (s) " " " | 4 | 2- | 6- | (b) | 27 | (b) | 19 | 2- | 2- | 5- | 4- | - |
| Chlorinated Pesticides | None(d) | (b) | None(d) | (b) | None(d) | (b) | None(d) | None(d) | None(d) | None(d) | None(d) | - |
| Aroclor 1254, a polychlorinated biphenyl (PCB), parts per billion of dry wt. | 78 | (b) | 332 | (b) | 59 | (b) | 146 | 19 | 33 | 23 | 197 | - |

* Exceeds EPA limit.
(a) Samples were separated by settling in Steinhart aquarium sea water.
(b) Insufficient sample for all tests. As many as possible of the E.P.A. required basic seven tests were run.
(c) Fractional separation by sieving using Steinhart aquarium sea water.
(d) No identifiable chlorinated hydrocarbon pesticides were found but this may have been caused by contamination from the plastic tube in which the samples were taken.

TABLE 3

SAN DIEGO HARBOR POLLUTION STUDY

ANALYSES OF CORES E1E AND E5E

| Core No. | E1E | | | | E5E | | | |
|---|---|---|---|---|---|---|---|---|
| Laboratory No. | PC-403 | PC-404 | PC-385 | PC-386 | PC-387 | PC-405 | PC-406 | PC-388 |
| Type of sample | Sieved(c) | Sieved(c) | Whole | Whole | Whole | Sieved(c) | Sieved(c) | Whole |
| Particle size | -#10,+#200 | -#200 | -#10 Sieve | -#10 Sieve | -#10 Sieve | -#10,+#200 | -#200 | -#10 Sieve |
| Depth, inches | 0-5½ | 0-5½ | 6½-9 | 17-20 | 0-6½ | 9-12 | 9-12 | 22½-26½ |
| Moisture content, % dry wt. | 22.1 | 320.2 | 23.9 | 23.6 | 54.1 | 22.0 | 310.3 | 57.5 |
| Volatile solids, % dry wt. | 0.9 | 11.1 * | 1.0 | 1.1 | 3.2 | 1.9 | 11.2 * | 2.5 |
| Chemical oxygen demand (COD), % dry wt. | 0.1 | 9.3 * | 0.1 | 0.1 | 1.5 | 0.9 | 5.8 * | 0.2 |
| Total Kjeldahl nitrogen, % dry wt. | 0.01 | 0.23* | 0.01 | 0.01 | 0.04 | 0.01 | 0.16* | 0.02 |
| Oil and grease, % dry wt. | 0.02 | 0.77* | 0.01 | 0.02 | 0.10 | 0.03 | 0.31* | 0.07 |
| Iron (Fe), % dry wt. | 1.1 | 7.6 | 1.4 | 1.0 | 2.0 | 1.6 | 8.2 | 1.6 |
| Heavy Metals | | | | | | | | |
| Mercury (Hg), 1X10$^{-4}$ % dry wt. | 0.2 | 3.4 * | 0.4 | 0.4 | 0.6 | 0.3 | 2.7 * | 0.7 |
| Lead (Pb) " " " | 12 | 176 * | 15 | 5 | 99 * | 49 | 279 * | 31 |
| Zinc (Zn) " " " | 39 | 441 * | 11 | 15 | 100 * | 50 | 275 * | 19 |
| Cadmium (Cd) " " " | 0.2 | 6.7 | 0.2 | 0.2 | 0.9 | 0.5 | 2.1 | 0.3 |
| Copper (Cu) " " " | 6 | 264 | 12 | 12 | 74 | 128 | 156 | 55 |
| Chromium (Cr) " " " | 22 | 92 | 17 | 3 | 15 | 17 | 148 | 28 |
| Arsenic (As) " " " | 0.5 | 3.8 | 0.6 | 0.7 | 3.5 | 1.4 | 11.9 | 2.8 |
| Nickel (Ni) " " " | 12 | 67 | 6 | 9 | 22 | 13 | 62 | 16 |
| Total Phosphorus (P), 1X10$^{-4}$ % dry wt. | 317 | 540 | 136 | 206 | 223 | 147 | 497 | 148 |
| Sulfide (S) " " " | 7 | 63 | 5 | ? | 37 | 5- | 360 | 11 |

* Exceeds EPA maximum limit.

(b) Insufficient sample for all tests. As many as possible of the E.P.A. basic seven tests were run.

(c) Fractional separation by sieving using Steinhart aquarium sea water.

TABLE 4

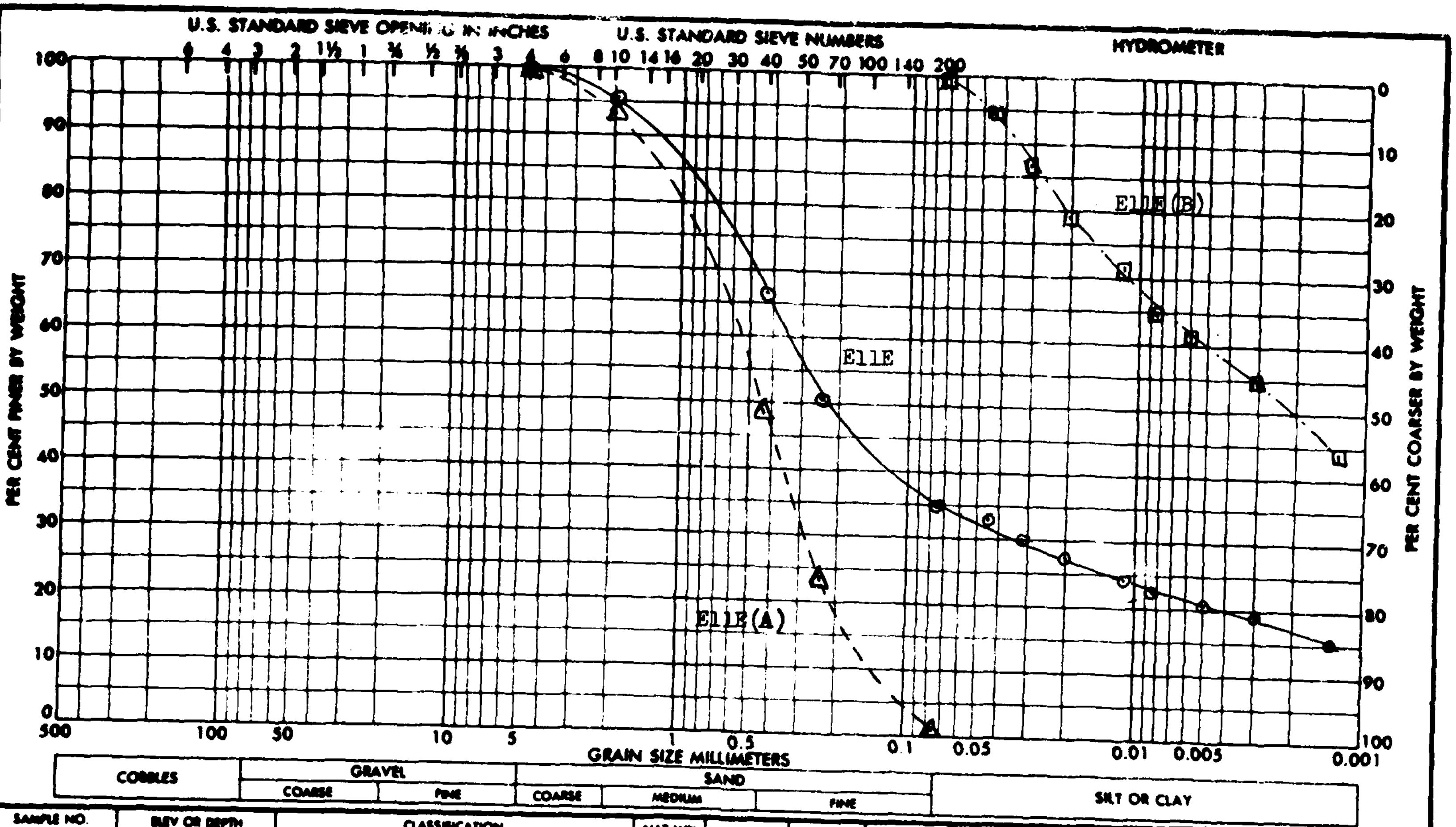
SAN DIEGO HARBOR POLLUTION STUDY

ANALYSIS OF CORES E6E AND E16E

| Core No. | E6E | | | | E16E | | | | | | EPA Max Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory No. | PC-389 | PC-407 | PC-408 | PC-390 | PC-409 | PC-410 | PC-411 | PC-412 | PC-393 | PC-394 | |
| Type of Sample | Whole | Sieved (c) | Sieved (c) | Whole | Sieved (c) | Sieved (c) | Sieved (c) | Sieved (c) | Whole | Whole | |
| Particle size | -#10 Sieve | -#10, +#200 | -#200 | -#10 Sieve | -#10, +#200 | -#200 | -#10, +#200 | -#200 | -#10 Sieve | -#10 Sieve | |
| Depth, inches | 0-8 | 19-25 | 19-25 | 44-48 | 0-4 | 0-4 | 13½-17 | 13½-17 | 34-37 | 40-42½ | |
| Moisture Content, % dry wt. | 24.1 | 26.1 | 369 | 22.4 | 32.1 | 256.9 | 29.6 | 307.0 | 35.1 | 30.9 | |
| Volatile solids, % dry wt. | 0.7 | 0.8 | 11.9 * | 0.8 | 1.2 | 8.7 * | 0.8 | 9.1 * | 2.4 | 1.8 | 6.0 |
| Chemical oxygen demand (COD), % dry wt. | 0.2 | 0.2 | 9.4 * | 0.1 | 0.2 | 5.8 * | 0.2 | 4.8 | 1.3 | 0.2 | 5.0 |
| Total Kjeldahl nitrogen, % dry wt. | 0.02 | 0.01 | 0.31* | 0.01 | 0.01 | 0.14* | 0.01 | 0.10 | 0.02 | 0.01 | 0.10 |
| Oil and grease, % dry wt. | 0.02 | 0.03 | 0.68* | 0.01 | (b) | 0.14 | 0.04 | (b) | 0.02 | 0.04 | 0.15 |
| Iron (Fe), % dry wt. | 1.5 | 1.3 | 7.0 | 1.3 | 1.8 | 6.8 | 1.3 | 6.9 | 2.2 | 1.6 | |
| **Heavy Metals** | | | | | | | | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 0.5 | 0.4 | 2.0 * | 0.4 | 0.6 | 1.6 * | 0.5 | 0.5 | 0.4 | 0.2 | 1.0 |
| Lead (Pb), " " " | 2 | 10 | 131 * | 2 | 11 | 43 | 5 | 33 | 10 | 18 | 50 |
| Zinc (Zn), " " " | 19 | 28 | 352 * | 11 | 42 | 128 * | 10 | 85 * | 19 | 10 | 50 |
| Cadmium (Cd), " " " | 0.1 | 0.3 | 3.8 | 0.1 | 0.3 | 1.8 | 0.1 | 1.6 | 0.3 | 0.3 | - |
| Copper (Cu), " " " | 10 | 10 | 235 | 6 | 7 | 64 | 6 | 41 | 31 | 30 | - |
| Chromium (Cr), " " " | 17 | 18 | 150 | 17 | 18 | 114 | 23 | 90 | 30 | 24 | - |
| Arsenic (As), " " " | 0.6 | 0.6 | 8.4 | 0.6 | (b) | 2.8 | 0.1 | (b) | 0.8 | 0.5 | - |
| Nickel (Ni), " " " | 9 | 10 | 52 | 7 | 11 | 46 | 9 | 53 | 14 | 12 | - |
| Total Phosphorus (P), $1X10^{-4}$ % dry wt. | 129 | 142 | 618 | 174 | (b) | 418 | 82 | 379 | 128 | 104 | - |
| Sulfide (S), " " " | 11 | 3 | 47 | 2- | (b) | 32 | 3- | (b) | 5- | 5- | - |

* Exceeds EPA maximum limit.
(b) Insufficient sample for all tests. As many as possible of the E.P.A. basic seven tests were run.
(c) Fractional separation by sieving using Steinhart aquarium sea water.

5




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| E11E | Homogenized 0-44 in. | *Clayey Sand (SC) | 30.8 | | | |
| E11E(A) | " | Sand fraction | | | | |
| E11E(B) | " | Flack fraction | | | | |
| | | * Visual Classification | | | | |

PROJECT SAN DIEGO HARBOR

AREA Core Sample

BORING NO. E11E

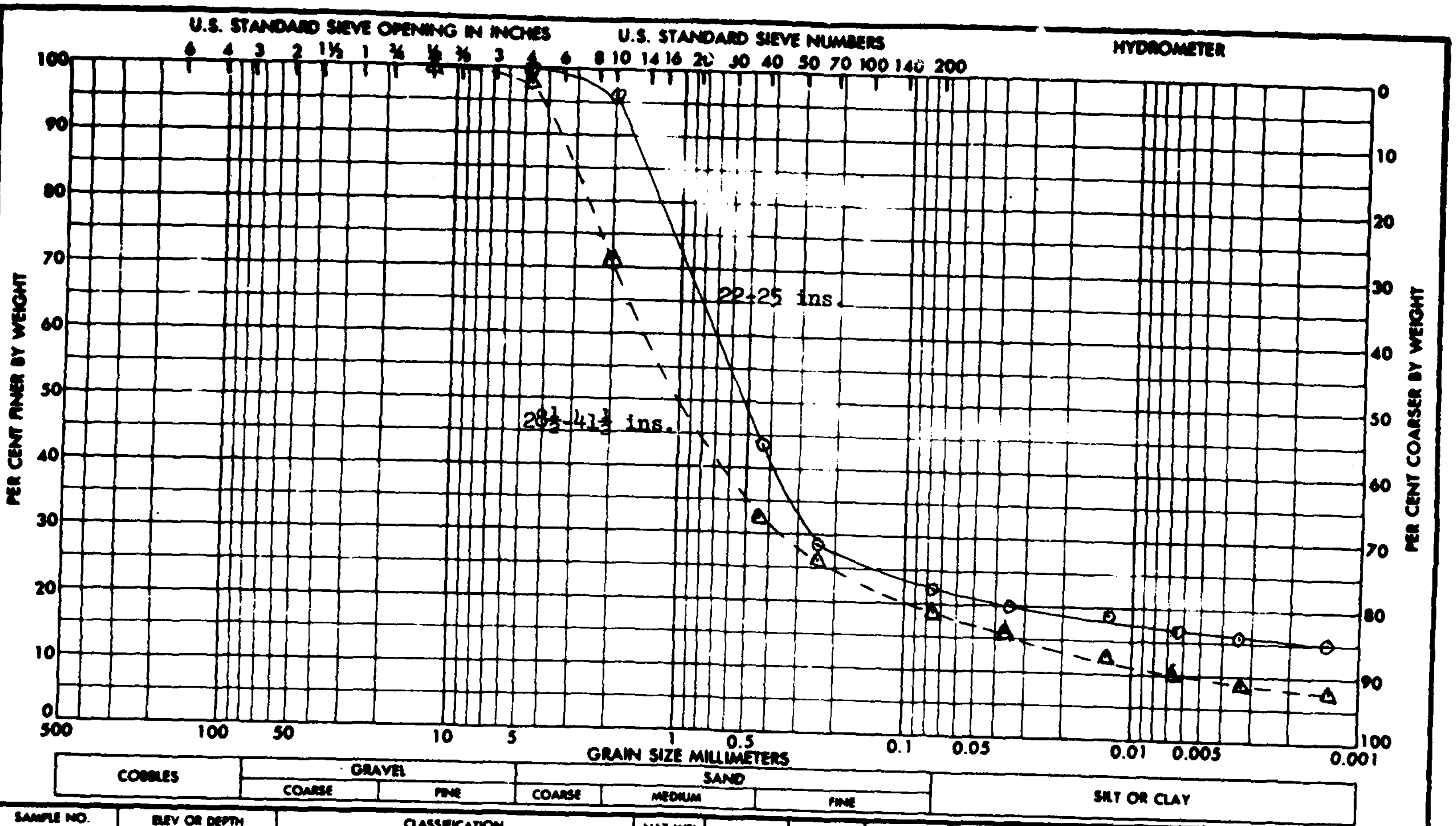
DATE

**GRADATION CURVES**

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE

Plate 1




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | 22-25 | *Clayey Sand (SC) | | | | |
| | 28½-41½ | *Clayey Sand (SC) | | | | |
| | | *Visual Classification | | | | |

PROJECT San Diego Harbor

AREA Core Samples

BORING NO. E11E

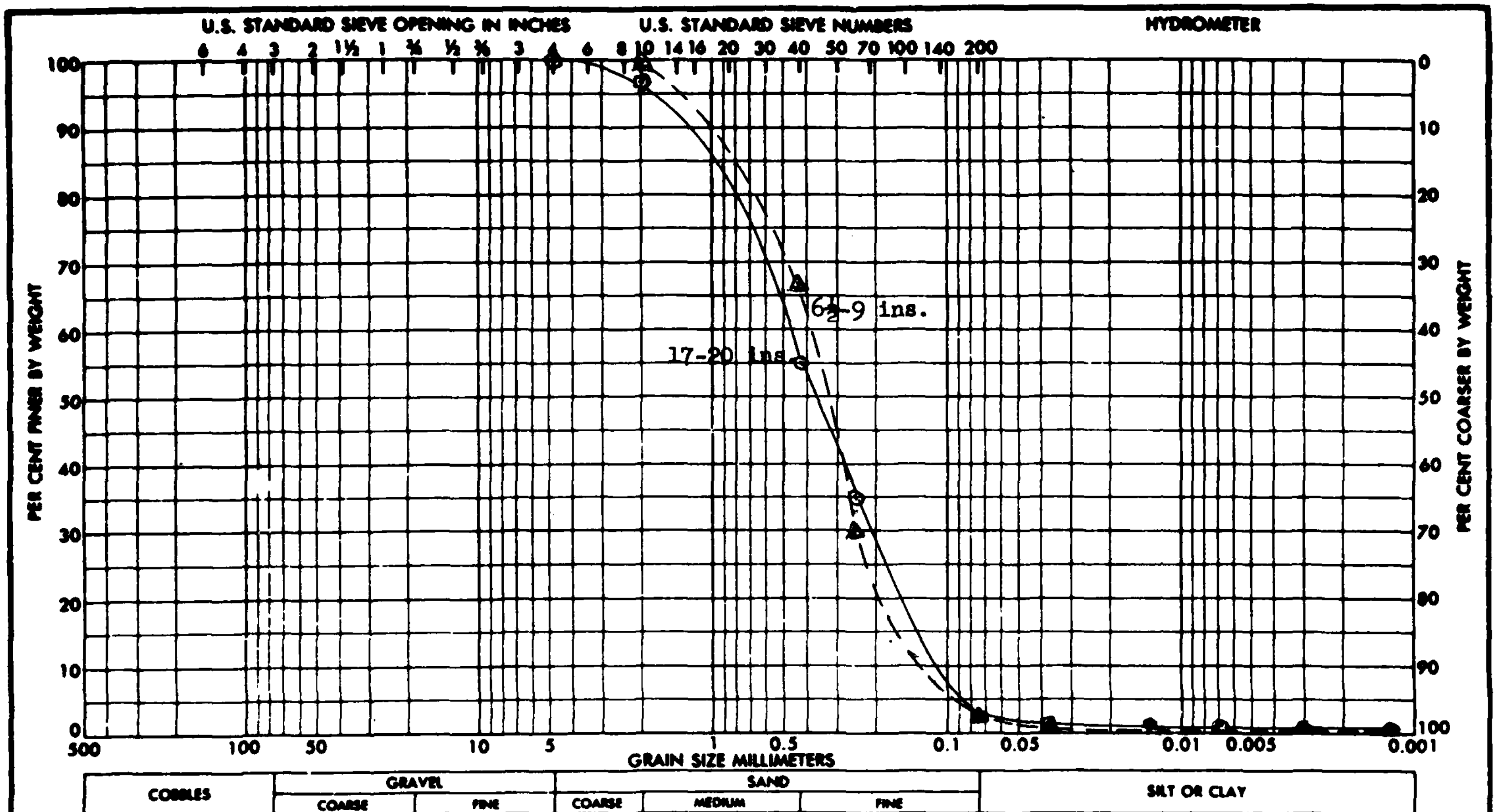
DATE

**GRADATION CURVES**

ENG FORM 1 MAY 63 **2087** REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

U.S. GOVERNMENT PRINTING OFFICE 1963 O—700-186

Plate 2




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | 6½-9 | Sand (SP) | | | | |
| | 17-20 | Sand (SP) | | | | |
| | | | | | | |
| | | | | | | |

PROJECT San Diego Harbor

AREA Core Sample

BORING NO. E1E

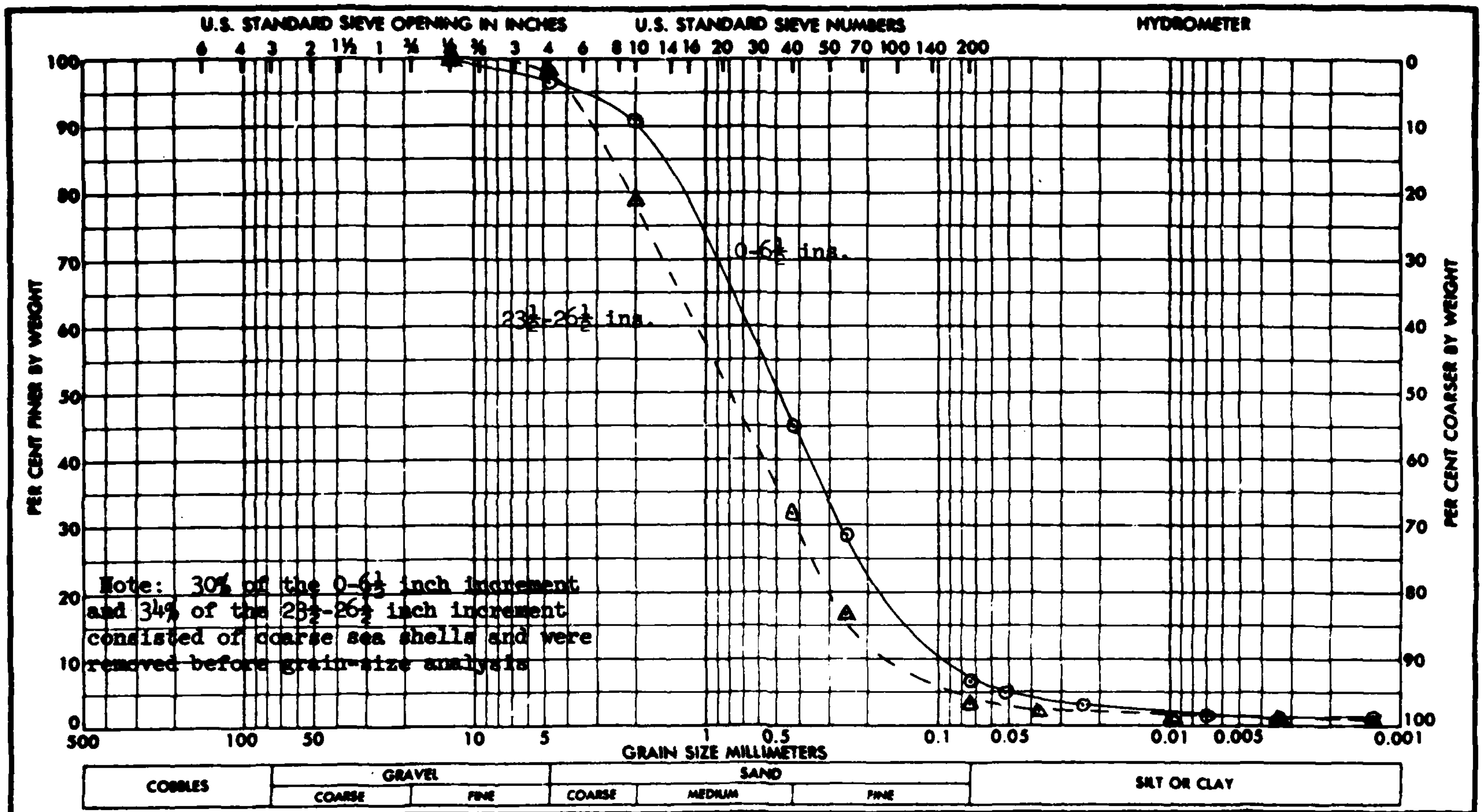
DATE

## GRADATION CURVES

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE 1963 0F—700-126

Plate 3




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | 0-6½ | Silty Sand (SW-SM) | | | | |
| | 23½-26½ | Sand (SP) | | | | |
| | | | | | | |
| | | | | | | |

PROJECT San Diego Harbor

AREA Core Sample

BORING NO E5E

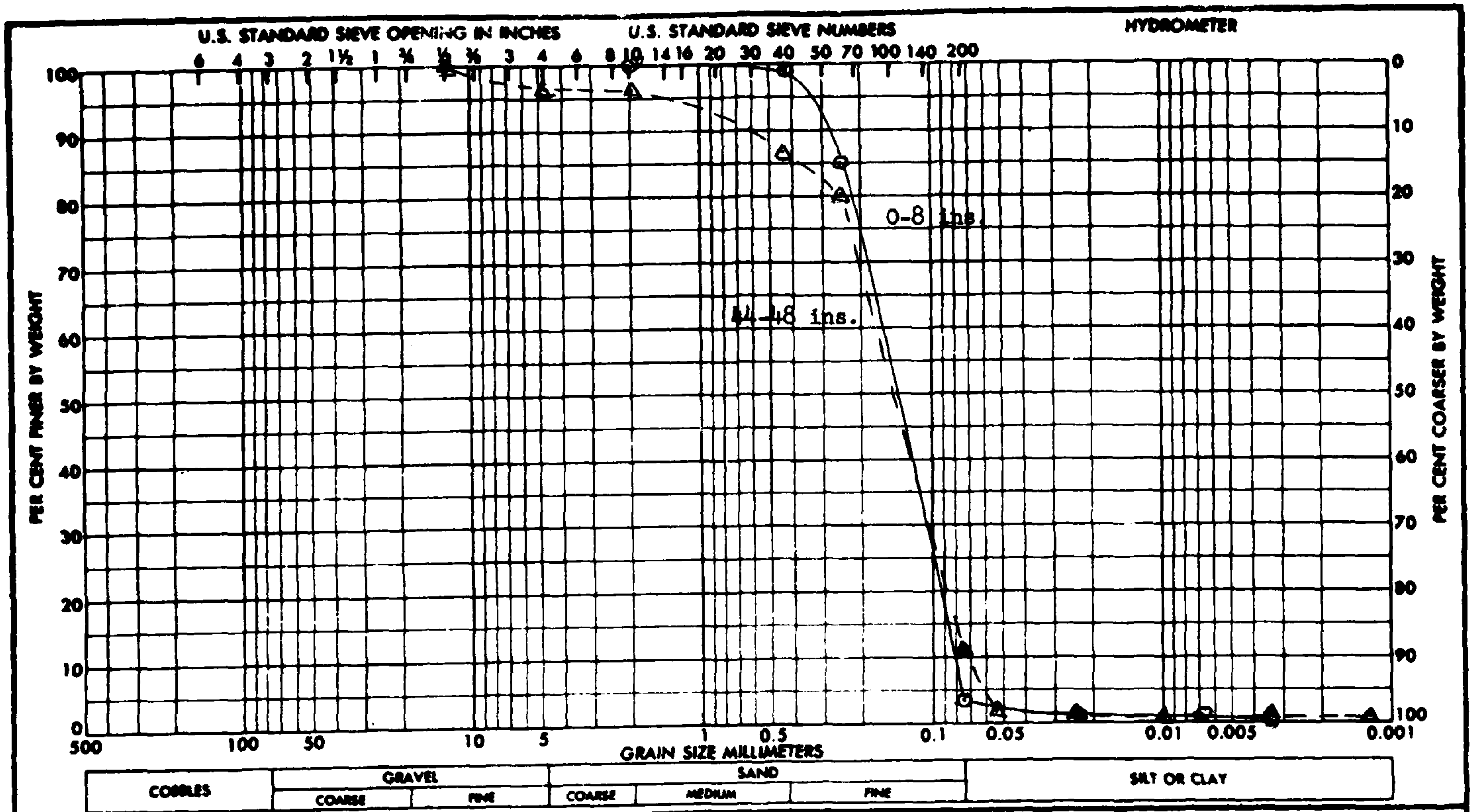
DATE

**GRADATION CURVES**

ENG FORM 2087 1 MAY 63 — REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE 1963 0F—700-184

Plate 4




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | 0-8 | Sand (SP) | | | | |
| | 44-48 | Silty Sand (SP-SM) | | | | |

PROJECT San Diego Harbor

AREA Core Sample

BORING NO E6E

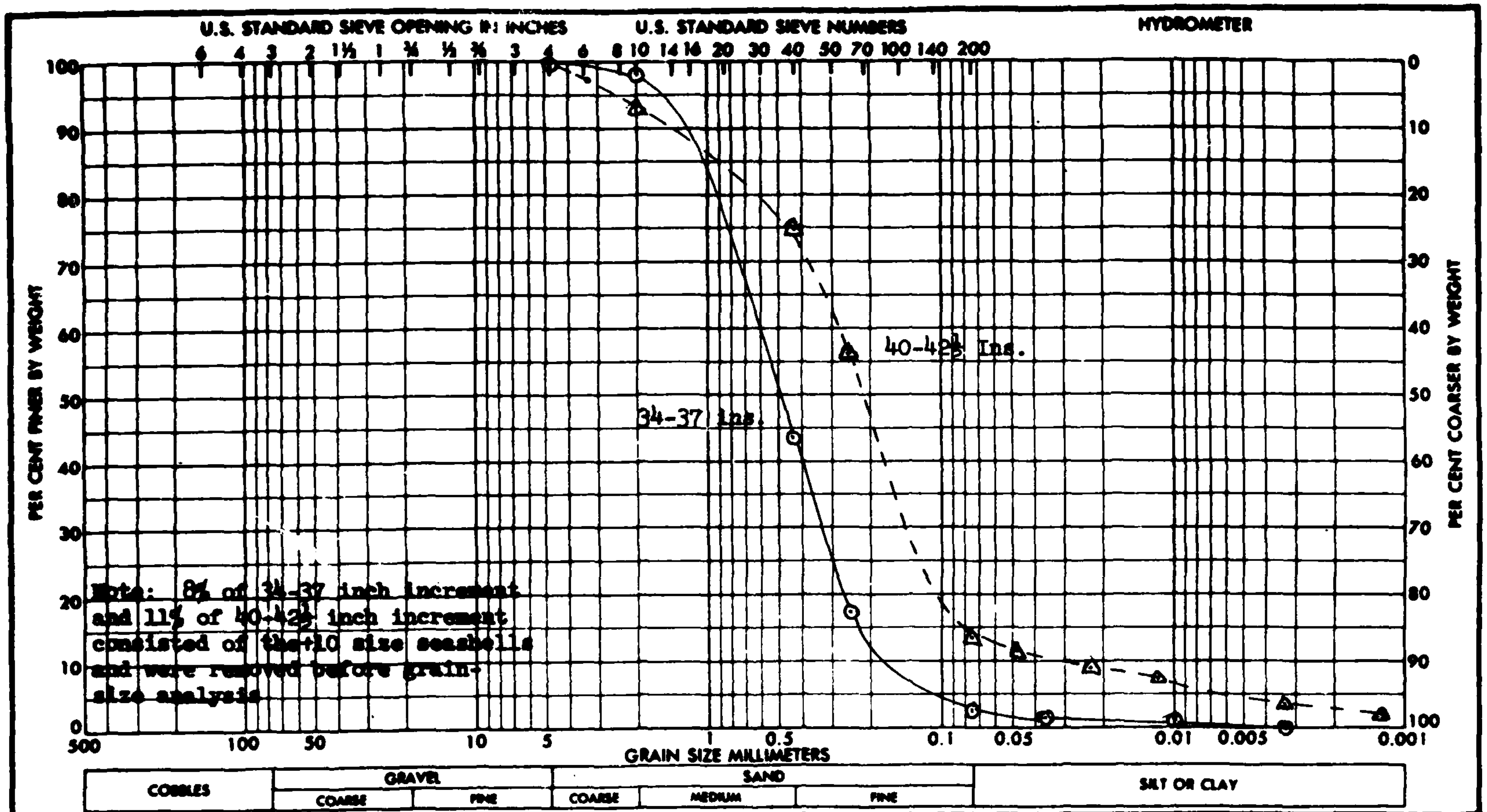
DATE

**GRADATION CURVES**

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U S GOVERNMENT PRINTING OFFICE 1963 0F—700-186

Plate 5




| SAMPLE NO. | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | 34-37 | Sand (SP) | | | | |
| | 40-42½ | *Clayey Sand (SC) | | | | |
| | | | | | | |
| | | *Visual Classification | | | | |

**GRADATION CURVES**

| | |
|---|---|
| PROJECT | San Diego Harbor |
| AREA | Core Samples |
| BORING NO. | E16E |
| DATE | |

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE 1963 O—700-120

Plate 6

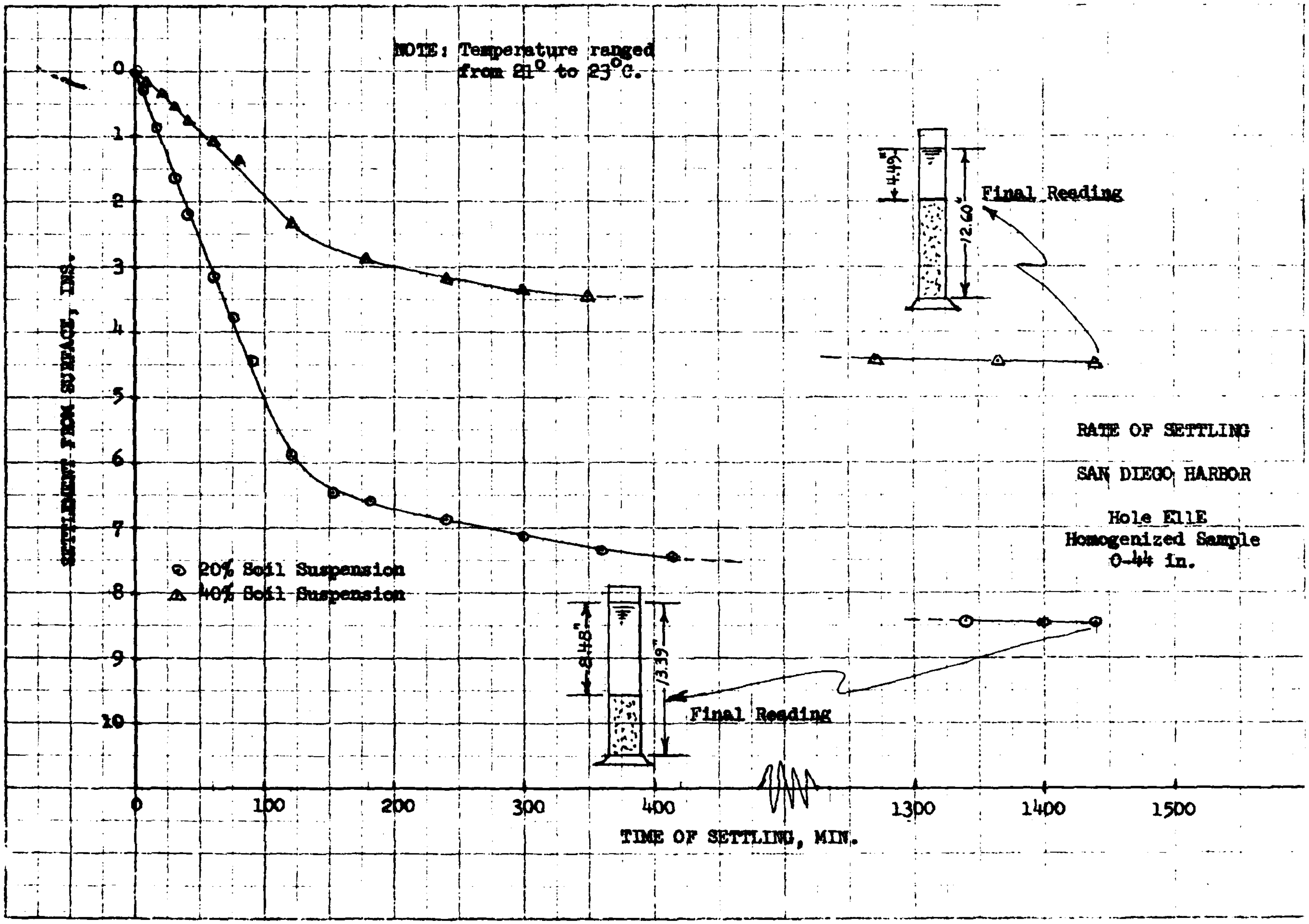

NOTE: Temperature ranged from 21° to 23°C.
RATE OF SETTLING
SAN DIEGO HARBOR
Hole E11E
Homogenized Sample
0-44 in.
20% Soil Suspension
40% Soil Suspension
Final Reading
4.49"
12.60"
Final Reading
8.48"
13.39"
SETTLEMENT FROM SURFACE, INS.
TIME OF SETTLING, MIN.
0
1
2
3
4
5
6
7
8
9
10
0
100
200
300
400
1300
1400
1500

Plate 7

# FIELD LOG SHEET

| PROJECT | HOLE NO. | DATE DRILLED |
|---|---|---|
| San Diego Harbor | E1 E | 22 January 1972 |
| SECTION | DIAMETER 2 1/4" | DRILLING TIME 5 min |
| LOCATION S 30,100 W 13,750 | DEPTH OF HOLE 2.2' | MOVING TIME |
| GROUND ELEVATION M.L.L.W. −42.7' | CASING USED none | INSPECTOR S. F. Abel |
| GROUND WATER ELEVATION marine | REMARKS tube sample using pneumatic tools, floating equip. & hard hat diver | |

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS | DEP. | N |
|---|---|---|---|---|---|---|
| **Field description, all material in tube.** | | | Top of tube sample is a med. to fine gr. sand grading to silty clay to clay at the bottom. | | 0.5 | |
| | | | | | 2.0 | |
| | | | | | 3.5 | |
| | | 2.2 | core recovery 2.2' | | | |
| **Laboratory description after tube was slit open to expose material.** | | | | | 5.0 | |
| | | 0.0 | | | 6.5 | |
| | | 0.4 | MEDIUM DARK SHELLY SANDS, BLACK LAYERS — STRONG "CRUDE OIL" SMELL. | | 8.0 | |
| | | | MEDIUM-COARSE YELLOWISH SAND AND BROKEN SHELLS, NO ODOR. | | 9.5 | |
| | | 2.2 | | | 11.0 | |
| | | | BOTTOM OF HOLE<br>LOGGED MPW/SPD 7FEB72 | | 12.5 | |
| | | | | | 14.0 | |
| | | | | | 15.5 | |

E1E

## DIVER'S COMMENTS & DESCRIPTIONS WHILE WORKING UNDER WATER

There is a fine grained sand all over the bottom having a thickness up to 2 inches. Underlying this sand is a gumbo clay appearing to be spotty. Balls of clay material were found in a small area near core EIE lying on the surface. A bottom sample of the balls of clay showed to be silty clay to clay.

Diver noticed very little sea life except for worm bores on the surface. Current is about 1 knot with visibility up to 15'.

Drilling became difficult and the equipment refused to advance beyond 2.2 feet. Diver drilled about 2.2 feet and retrieved a 2.2 foot core.

FIELD LOG SHEET

| PROJECT | HOLE NO. | DATE DRILLED |
|---|---|---|
| San Diego Harbor | E5E | 22 January 1972 |
| SECTION | DIAMETER 2 1/4" | DRILLING TIME 10 min |
| LOCATION S 15,700 E 3,350 | DEPTH OF HOLE 3.0' | MOVING TIME |
| GROUND ELEVATION M.L.L.W. -37.0' | CASING USED none | INSPECTOR S. E. Abel |
| GROUND WATER ELEVATION marine | REMARKS tube sample, using pneumatic tools; floating equip; hard hat diver | |

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS | DEP. | N |
|---|---|---|---|---|---|---|
| Field description, all material in tube. | | 0.0 – 3.0' | Top of tube sample is gravelly sand with shells, assumed all the way to the bottom - core recovery 2.3' | | 0.5 / 2.0 / 3.5 | |

**Laboratory description after tube was slit open to expose material.**

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS | DEP. | N |
|---|---|---|---|---|---|---|
| | | 0.0 | | | 5.0 | |
| | | 0.5 | COARSE SAND, WHOLE SHELLS AND SHELL FRAGMENTS; BLACK ORGANICS; SHARP BOUNDRY. | | 6.5 / 8.0 | |
| | | 1.8 | BLACK SILTY MUD WITH SHELL FRAGMENTS; SHARP BOUNDRY. | | 9.5 / 11.0 | |
| | | 2.2 | YELLOWISH SAND AND BROKEN SHELLS | | 12.5 | |
| | | | BOTTOM OF HOLE SAMPLER PUSHED 3.0' LOGGED MPW/SPD 7FEB72 | | 14.0 / 15.5 / 17.0 | |

## DIVER'S COMMENTS & DESCRIPTIONS WHILE WORKING UNDER WATER

Ground surface very hard to penetrate with finger. The surface is covered with shells with underlying gravelly sand.

There is very little marine life present, however, there are a few worm bore holes present. Visibility is about 6 to 7 feet. Diver said the current was so strong he had to lean against his air hammer to stand up.

Drilling was hard from 0.0' to about 3.0' at which depth the capability of the air gun was met. Core recovery was 2.3 feet.

# FIELD LOG SHEET

| PROJECT | HOLE NO. | DATE DRILLED |
|---|---|---|
| San Diego Harbor | E 6 E | 23 January 1972 |
| SECTION | DIAMETER 2 1/4" | DRILLING TIME 15 min. |
| LOCATION S 17,425 E 6,425 | DEPTH OF HOLE 4.2' | MOVING TIME — |
| GROUND ELEVATION M.L.L.W. -36.2' | CASING USED none | INSPECTOR S.E. Abel |
| GROUND WATER ELEVATION marine | REMARKS tube sample using pneumatic tools, floating equip. & hard hat diver | |

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS | DEP. | N |
|---|---|---|---|---|---|---|
| Field description, all material in tube. | | 0.0 | tube sample at top med. gr. sand with organic matter, with sand and shells at the bottom | | 0.5 | |
| | | | | | 2.0 | |
| | | | | | 3.5 | |
| | | 4.2 | core recovery 4.2' | | 5.0 | |
| Laboratory description after tube was slit open to expose material. | | | | | | |
| | | 0.0 | YELLOWISH GRAY, MEDIUM SAND, SLIGHT ODOR. | | 6.5 | |
| | | | | | 8.0 | |
| | | 1.5 | | | 9.5 | |
| | | | BLACK SANDY MUD, VERY "FISHY" ODOR, BROKEN SHELLS, LIVE WORMS AND CLAMS | | 11.0 | |
| | | 2.5 | | | 12.5 | |
| | | 2.7 | YELLOWISH SAND AND SHELLS | | | |
| | | 3.1 | SHELL AND SAND | | | |
| | | 3.5 | YELLOWISH COARSE SAND | | | |
| | | 4.0 | GRAYISH SAND, SOME SHELLS | | | |
| | | | BOTTOM OF HOLE | | | |
| | | | LOGGED MPW/SPD 7 FEB 72 | | | |

DIVER'S COMMENTS & DESCRIPTIONS
WHILE WORKING UNDER WATER

The ground surface is quite sandy but firm. The ground surface is too hard to dig a hand sample. Some little pebbles were sticking up out of the ground surface and are entrapped in the sediment.

There is more marine life present here than in previous areas. Some evidence of clams, worm bores present, some razor clam shells, and some other shells lying loose on the ground surface. There is about a 2 knot current with visibility from 6' to 8'.

Diver drilled into a 30 to 40 pound boulder about 2" below the surface thus causing the hole to be relocated a few feet. At or near 2.5 feet drilling became hard and continued hard to refusal at 4.2 feet. Core recovery was 4.2 feet.

# FIELD LOG SHEET

| PROJECT | HOLE NO. | DATE DRILLED |
|---|---|---|
| San Diego Harbor | E 11 E | 23 January 1972 |
| SECTION: C | DIAMETER: 2 1/2" | DRILLING TIME: 15 min. |
| LOCATION: 526,800 E 15,925 | DEPTH OF HOLE: 4.0' | MOVING TIME: — |
| GROUND ELEVATION MLLW: -31.9' | CASING USED: none | INSPECTOR: S. E. Abel |
| GROUND WATER ELEVATION: marine | REMARKS: tube sample using pneumatic tools floating equip. & hard hat diver | |

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS | DEP. | N |
|---|---|---|---|---|---|---|
| Field description, all material in tube. | | 0.0 | top of tube sample is silt mud with med. gr. sand tightly compacted w/some gravel present - at the core bottom | | 0.5 | |
| | | | | | 2.0 | |
| | | | | | 3.5 | |
| | | 4.0' | recovery 3.6' | | 5.0 | |
| Laboratory description after tube was slit open to expose material. | | | | | | |
| | | 0.0 | | | 6.5 | |
| | | | BLACK SILTY CLAY, SOMEWHAT FLUID CONSISTENCY, STRONG "CRUDE OIL" SMELL. | | 8.0 | |
| | | 1.5 | | | 9.5 | |
| | | 1.9 | BLACK, SLIGHTLY BROWNISH COMPACT CLAY. | | 11.0 | |
| | | | CLAY AND SHELLS. | | | |
| | | | TAN, MEDIUM TO COARSE SAND. | | 12.5 | |
| | | 3.2 | | | 14.0 | |
| | | 3.5 | YELLOWISH, WATER SATURATED, COARSE SAND. | | | |
| | | | DARK YELLOW SILTY CLAY, COMPACT DRY CLAY AT BOTTOM. | | | |
| | | | BOTTOM OF HOLE<br>LOGGED MPW/SPD 7FEB72 | | | |

E 11 E

DIVER'S COMMENTS & DESCRIPTIONS
WHILE WORKING UNDER WATER

On the ground surface were many, many shrimp holes in the soft mud. The diver could push his hand down through the mud about 20 inches and hit a firmer material later described as sand.

On the divers descent strings in the water were noted to be like jellyfish tentacles. Marine life consisted of small fish, few clam shells, a little spider crab, and shrimp holes.

Drilling mod hard at 3'. Diver thought it was a sandstone. The hole was drilled to refusal at a depth of 4.0'. Core recovery was 3.6 feet and apparently shortened 0.5 feet at the top due to vibration of the soft mud.

# FIELD LOG SHEET

| PROJECT | HOLE NO. | DATE DRILLED |
|---|---|---|
| San Diego Harbor | E16E | 23 January 1972 |
| SECTION | DIAMETER 2¼" | DRILLING TIME 15 min |
| LOCATION 700 S 36~~9~~ E 19,750 | DEPTH OF HOLE 5.0' | MOVING TIME — |
| GROUND ELEVATION N.L.L.W. -30.7' | CASING USED none | INSPECTOR S.F. Abel |
| GROUND WATER ELEVATION marine | REMARKS tube sample using pneumatic tools, floating equip. & hard hat diver | |

| SERIAL | SAMPLE | LEGEND | DESCRIPTION AND CONDITION OF MATERIAL | REMARKS |
|---|---|---|---|---|
| **Field description, all material in tube.** | | 0.0 | top of tube sample is a soft mud with loose unconsolidated gravelly sand at the bottom. core recovery 3.6'. | |
| | | 5.0' | | |
| **Laboratory description after tube was slit open to expose material.** | | | | |
| | | 0.0 | | |
| | | | SOFT, BLACK CLAYEY SILT, SLIGHT PETROLEUM ODOR. | |
| | | 1.1 | | |
| | | | DARK GRAY TO BLACK SANDY SILT, MICA FLAKES. | |
| | | 2.5 | | |
| | | | DARK, SANDY, SHELLY SANDS | |
| | | 3.2 | | |
| | | 3.5 | DARK TAN, SHELLY SANDS | |

BOTTOM OF HOLE
LOGGED MPW/SPD 7 FEB 72

E16E

## DIVER'S COMMENTS & DESCRIPTIONS WHILE WORKING UNDER WATER

The ground surface is very soft mud and the diver can penetrate about 2.5 feet with his hand. About 0.5 feet of the top of the tube sample was spilled while lifting it out of the water. This lost section was replaced with a fresh core from the ground surface to about a depth of 0.5 feet.

No apparent marine life was present. No current was noticed and the visibility was about 8 feet.

The hole was drilled to a total depth of 5.0'. Core recovery was 3.6 feet. The core loss can be partially attributed to vibrations of the soft mud plus possible loss due to pulling out of the hole.

DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS

LABORATORY

# SAN DIEGO HARBOR

# PROPOSED DISPOSAL AREAS

# OFFSHORE FROM CORONADO TO MEXICAN BORDER

# ANALYSIS OF BOTTOM SEDIMENTS

SAUSALITO, CALIFORNIA

August 1972

SAN DIEGO HARBOR
PROPOSED DISPOSAL AREAS
OFFSHORE FROM CORONADO TO MEXICAN BORDER
ANALYSIS OF BOTTOM SEDIMENTS

August 1972

AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544, No. CIV-73-6, 1 August 1972, from the Los Angeles District.

PURPOSE AND SCOPE

2. The purpose of this study was to determine the quantities of specified pollutants in samples from the ocean floor in areas proposed for disposal of dredge material from the channel deepening project, San Diego Harbor, San Diego, California. Tests requested were as listed in Tables 1 and 2 plus grain-size analysis.

SAMPLES

3. On 2 August 1972 grab samples were taken, by divers, from the ocean floor at ten locations along the coast from Coronado to the Mexican Border. Three samples were taken at each location, two for chemical analysis and one for grain-size analysis. The samples were placed in glass jars, iced and delivered to the laboratory on 3 August 1972.

TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, iron, lead, zinc, copper, cadmium, chromium and nickel were determined according to "Chemistry Laboratory Manual, Bottom Sediments", compiled by Great Lakes Region Committee on Analytical Methods and published by Environmental Protection Agency (EPA), Federal Water Quality Administration, December 1969.

b. Mercury, Hatch and Ott Method using a Coleman 50 Mercury Analyzer.

c. Arsenic, Method 104A of "Standard Methods for Examination of Water and Wastewater", 13th Edition 1971, published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation.

d. Total phosphorus, Standard Methods, 13th Edition, Method 223E.

e. Sulfide, Standard Methods, 13th Edition, Method 228B.

f. Particle size, Engineer Manual EM 1110-2-1906.

## TEST RESULTS

5. Data are presented as follows:

a. Tables 1 and 2 show locations of the samples and give the chemical analyses. The ingredients are shown as percent dry weight of the samples, or as $1X10^{-4}$ percent (or parts per million) of dry weight.

1 part per million (ppm) = $1X10^{-4}$ percent
1 ppm = 0.0001 percent
1 percent = 10,000 ppm

b. ENG Forms 2087 (Plates 1-3) show gradation curves and visual classifications of one sample from each of the locations.

c. The log sheet SPL Form 8, (Plate 4) gives additional information on sample locations.

## COMMENTS

6. None of the samples exceeded EPA maximum limits for volatile solids, COD, total Kjeldahl nitrogen, oil and grease, mercury, lead or zinc.

7. The sulfide determination does not include volatile sulfides as the samples were not treated in the field.

8. The samples were principally sand and silt and did not contain high quantities of pollutants.

TABLE 1

SAN DIEGO HARBOR DISPOSAL AREAS
OFFSHORE FROM CORONADO TO MEXICAN BORD

ANALYSIS OF BOTTOM SEDIMENTS

| Location | W-2 | | W-3 | |
|---|---|---|---|---|
| Coordinates, Old Town | S. 26,700<br>E. 1,300 | | S 30,500<br>E 5,500 | |
| Elevation, MLLW, ft. | -20.8 | | -19.0 | |
| Field Sample | A | B | | B |
| Laboratory, No., PC- | 462 | 463 | 464 | 465 |
| Moisture content, % dry wt. | 35.3 | 35.0 | 33.2 | 30.3 |
| Volatile solids, % dry wt. | 0.9 | 0.9 | 0.0 | 0.9 |
| Chemical oxygen demand (COD), % dry wt. | 0.4 | 0.4 | 0.5 | 0 5 |
| Total Kjeldahl nitrogen, % dry wt. | 0.03 | 0.02 | 0.02 | 0.02 |
| Oil and grease, % dry wt. | 0.02 | 0.01 | 0.01 | 0.01 |
| Iron (Fe), % dry wt. | 0.4 | 0.4 | 0.5 | 0.6 |
| <u>Heavy Metals</u> | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 0.1 | 0.1 | 0.1 | 0.1 |
| Lead (Pb), " " " | 5 | 6 | 4 | 5 |
| Zinc (Zn), " " " | 18 | 12 | 12 | 12 |
| Cadmium (Cd), " " " | 0.3 | 0.2 | 0.0 | 0.1 |
| Copper (Cu), " " " | 2 | 2 | 2 | 2 |
| Chromium (Cr), " " " | 49 | 58 | 57 | 60 |
| Arsenic (As), " " " | 0.11 | 0.01- | 0.01- | 0.01- |
| Nickel (Ni), " " " | 26 | 27 | 25 | 34 |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | 180 | 191 | 226 | 228 |
| Sulfide (S), $1X10^{-4}$ % dry wt. | 2- | 4 | 2- | 2- |

TABLE 1

SAN DIEGO HARBOR DISPOSAL AREAS
FFSHORE FROM CORONADO TO MEXICAN BORDER

ANALYSIS OF BOTTOM SEDIMENTS

| W-2 | | W-3 | | W-4 | | W-5 | | W-6 | | EPA |
|---|---|---|---|---|---|---|---|---|---|---|
| S. 26,700 | | S 30,500 | | S. 36,700 | | S. 41,700 | | S. 46,500 | | Max. |
| E. 1,300 | | E 5,500 | | E. 9,500 | | E. 12,000 | | E. 13,900 | | Limit |
| -20.8 | | -19.0 | | -20.3 | | -20.1 | | -20.0 | | |
| A | B | | B | A | B | A | B | A | B | |
| 2 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | |
| .3 | 35.0 | 33.2 | 30.3 | 32.5 | 33.0 | 30.2 | 31.1 | 32.8 | 32.7 | |
| .9 | 0.9 | 0.0 | 0.9 | 1.0 | 1.0 | 0.9 | 1.1 | 0.9 | 0.9 | 6.0 |
| .4 | 0.4 | 0.5 | 0 5 | 0.5 | 0.5 | 0.4 | 0.6 | 0.4 | 0.4 | 5.0 |
| .03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.10 |
| .02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.15 |
| 0.4 | 0.4 | 0.5 | 0.6 | 0.8 | 0.8 | 0.6 | 0.8 | 0.7 | 0.8 | |
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | 0.1 | 0.1 | 0.1 | 0.1 | 1.0 |
| 5 | 6 | 4 | 5 | 6 | 5 | 5 | 6 | 6 | 5 | 50 |
| 8 | 12 | 12 | 12 | 13 | 15 | 11 | 17 | 11 | 11 | 50 |
| 0.3 | 0.[illegible] | 0.[illegible] | 0.1 | 0.2 | 0.1 | 0.1- | 0.1- | 0.1 | 0.3 | |
| 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 2 | |
| 9 | 58 | 57 | 60 | 73 | 66 | 53 | 63 | 57 | 57 | |
| 0.11 | 0.01- | 0.01- | 0.01- | 0.07 | 0.16 | 0.01- | [illegible] | [illegible] | [illegible] | |
| 6 | 27 | 25 | 34 | 40 | 36 | 29 | 30 | 29 | 37 | |
| 0 | 191 | 220 | 228 | 291 | 287 | 205 | 245 | 194 | 241 | |
| 2- | 4 | 2- | 2- | 2- | 2- | 4 | 2- | 4 | 2- | |

2

13

TABLE 2

SAN DIEGO HARBOR DISPOSAL AREAS
OFFSHORE FROM CORONADO TO MEXICAN B(

ANALYSIS OF BOTTOM SEDIMENTS

| | | | | |
|---|---|---|---|---|
| Location | W-7 | | W-8 | |
| Coordinates, Old Town | S. 53,500<br>E. 15,000 | | S. 61,500<br>E. 15,400 | |
| Elevation MLLW, ft. | -25.9 | | -19.7 | |
| Field Sample | A | B | A | B |
| Laboratory No., PC- | 472 | 473 | 474 | 475 |
| Moisture content, % dry wt. | 33.4 | 31.8 | 33.8 | 33.6 |
| Volatile solids, % dry wt. | 0.8 | 0.8 | 1.5 | 1.2 |
| Chemical oxygen demand (COD), % dry wt. | 0.3 | 0.3 | 0.4 | 0.4 |
| Total Kjeldahl nitrogen, % dry wt. | 0.02 | 0.01 | 0.02 | 0.02 |
| Oil and grease, % dry wt. | 0.01 | 0.01 | 0.01 | 0.01 |
| Iron (Fe), % dry wt. | 1.0 | 0.3 | 0.3 | 0.3 |
| Heavy Metals | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 0.2 | 0.1 | 0.1 | 0.1 |
| Lead (Pb), " " " | 6 | 6 | 5 | 5 |
| Zinc (Zn), " " " | 13 | 12 | 17 | 18 |
| Cadmium (Cd), " " " | 0.2 | 0.2 | 0.2 | 0.3 |
| Copper (Cu), " " " | 2 | 1 | 2 | 3 |
| Chromium (Cr), " " " | 57 | 57 | 80 | 73 |
| Arsenic (As), " " " | 0.07 | 0.04 | 0.33 | 0.29 |
| Nickel (Ni), " " " | 35 | 25 | 35 | 40 |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | 188 | 214 | 339 | 256 |
| Sulfide (S), $1X10^{-4}$ % dry wt. | 2- | 2- | 2- | 2- |

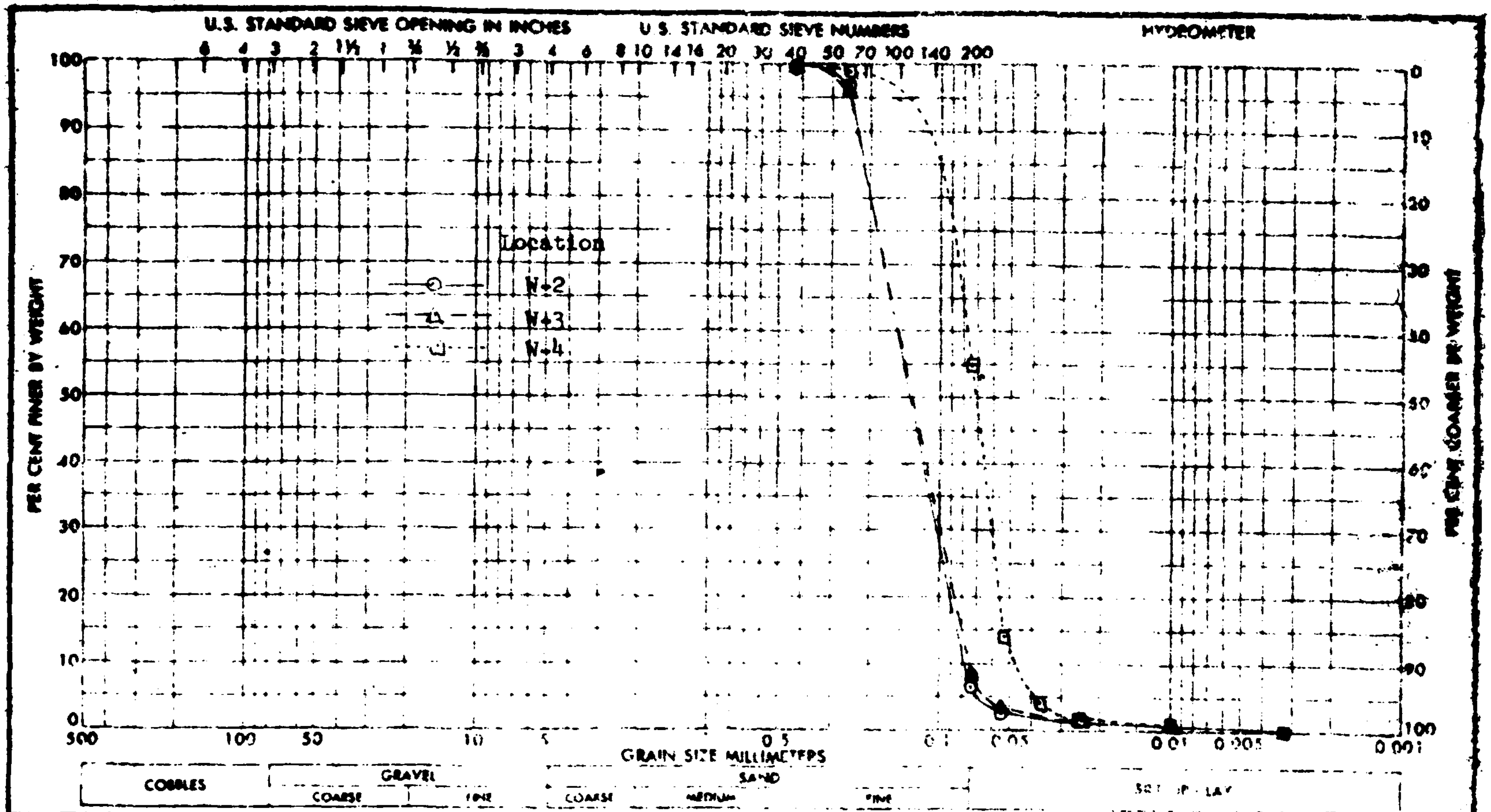
TABLE 2

SAN DIEGO HARBOR DISPOSAL AREAS
HORE FROM CORONADO TO MEXICAN BORDER

ANALYSIS OF BOTTOM SEDIMENTS

| -7 3,500 5,000 5.9 | W-8 S. 61,500 E. 15,400 -19.7 | | W-9 S. 66,300 E. 15,600 -16.5 | | W-10 S. 70,000 E. 17,000 -19.5 | | W-11 S. 78,000 E. 18,600 -24.2 | | EPA Max. Limit |
|---|---|---|---|---|---|---|---|---|---|
| B | A | B | A | B | A | B | A | B | |
| 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | |
| 31.8 | 33.8 | 33.6 | 25.6 | 25.1 | 28.1 | 29.7 | 24.1 | 30.8 | |
| 0.8 | 1.5 | 1.2 | 0.6 | 0.5 | 1.2 | 1.2 | 0.5 | 0.9 | 6.0 |
| 0.3 | 0.4 | 0.4 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.6 | 5.0 |
| 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.10 |
| 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.15 |
| 0.3 | 0.3 | 0.3 | 0.1 | 0.2 | 0.[illegible] | 0.7 | 0.7 | 0.8 | |
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 1.0 |
| 6 | 5 | 5 | 4 | 5 | 5 | 6 | 6 | 4 | 50 |
| 12 | 17 | 18 | 9 | 8 | 11 | 14 | 8 | 15 | 50 |
| 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.4 | 0.2 | 0.3 | 0.4 | |
| 1 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | |
| 57 | 80 | 73 | 60 | 58 | 53 | 55 | 72 | 85 | |
| 0.04 | 0.33 | 0.29 | 0.01- | 0.24 | 0.06 | 0.24 | 0.07 | 0.17 | |
| 25 | 35 | 40 | 25 | 24 | 24 | 39 | 35 | 37 | |
| 214 | 339 | 256 | 198 | 185 | 191 | 160 | 266 | 267 | |
| 2- | 2- | 2- | 2- | 2- | 2- | 2- | 2- | 2- | |

2




| Location | ELEV | CLASSIFICATION | | | PI | |
|---|---|---|---|---|---|---|
| W-2 | -20.8 | Silty Sand (SP-SM) | | | NP | |
| W-3 | -19.0 | Silty Sand (SP-SM) | | | NP | |
| W-4 | -20.3 | *Sandy Silt (ML) | | | | |
| | | * Visual Classification | | | | |

PROJECT: SAN DIEGO HARBOR
SURFACE SAMPLES

AREA: Offshore from Coronado to Mexican border.

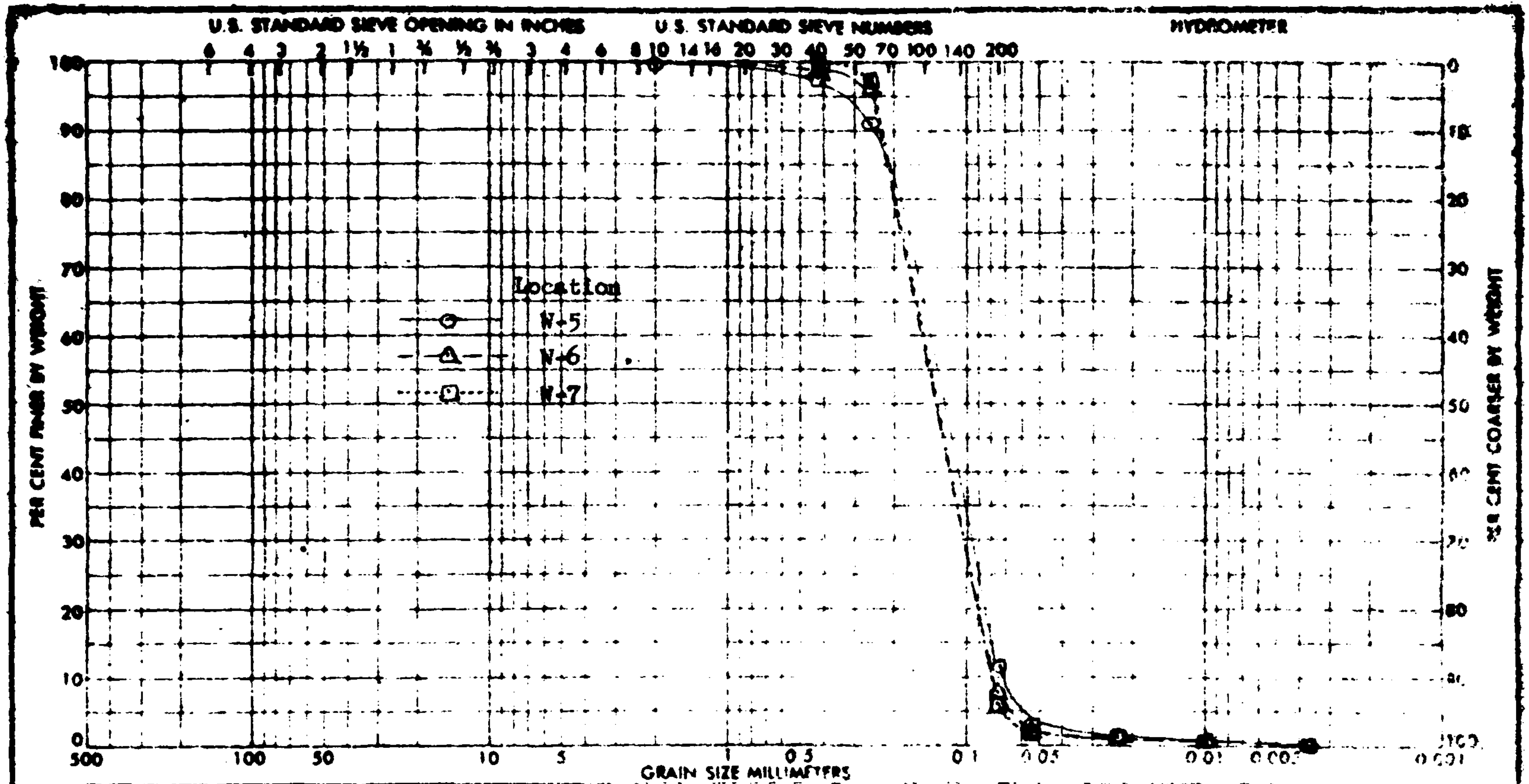
Location - W-2, 3 & 4

DATE

**GRADATION CURVES**

WES FORM 2087 MAY 63 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

Chart 1




| COBBLES | GRAVEL COARSE | GRAVEL FINE | SAND COARSE | SAND MEDIUM | SAND FINE | SILT OR CLAY |
|---|---|---|---|---|---|---|

| Location | ELEV | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| W-5 | -20.1 | Silty Sand (SP-SM) | | | NP | |
| W-6 | -20.0 | Silty Sand (SP-SM) | | | NP | |
| W-7 | -25.9 | Silty Sand (SP-SM) | | | NP | |

PROJECT SAN DIEGO HARBOR
SURFACE SAMPLES

AREA Offshore from Coronado to Mexican Border

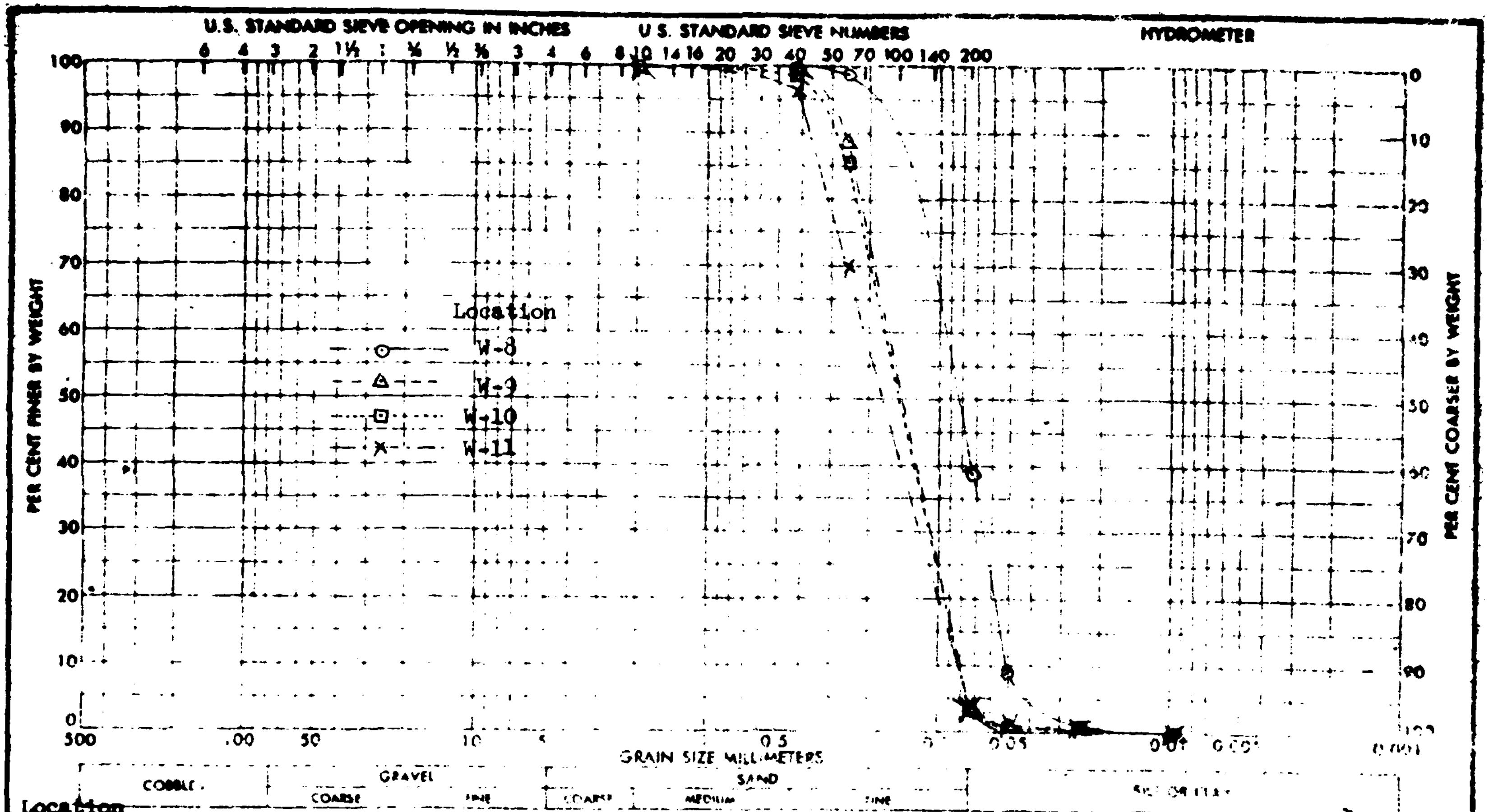
Location - W-5, 6 & 7

DATE

GRADATION CURVES

ENG FORM 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

Sheet 8




| Location | ELEV | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| W-8 | -19.7 | Silty Sand (SM) | | | NP | |
| W-9 | -16.5 | Sand (SP) | | | NP | |
| W-10 | -19.5 | Sand (SP) | | | NP | |
| W-11 | -24.2 | Sand (SP) | | | NP | |

PROJECT: SAN DIEGO HARBOR
SURFACE SAMPLES

AREA: Offshore from Coronado to Mexican border.

Location - W-8, 9, 10 & 11

DATE

GRADATION CURVES

ENG FORM 1 MAY 63 2087 REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

Chart 3

## FIELD LOG SHEET

SHEET 1 OF 1

| | | |
|---|---|---|
| PROJECT San Diego Harbor, California | HOLE NO. | DATE DRILLED 2 August 1972 |
| ITEM Water Quality Control Board Sample Location | LOCATION Offshore from Coronado to Mexican Border | GROUND ELEV. / GRD. WATER Marine |
| EQUIPMENT USED Charles W. Hux(CE) Art Coe, Joe Berry (WQCB) | XXXXXXXX dove with sample jars and filled them | INSPECTOR James R. Townsend |

The divers each filled a jar with surface material at whatever point they reached the bottom, usually various points within 50 feet of the boat location. Location elevation (MLLW) Old Town coordinates (Scaled from C&GS Chart 5107, Ed. 25 Sep 71).

| SERIAL | SAMPLE NO. | DEPTH | DESCRIPTION AND CONDITION OF MATERIAL | DEP. | N |
|---|---|---|---|---|---|
| | W-1 | | Not sampled | | |
| | W-2 | -20.8 | S.26,700 E. 1300 | | |
| | W-3 | -19.0 | S.30,500 E. 5500 | | |
| | W-4 | -20.3 | S.36,700 E. 9500 | | |
| | W-5 | -20.1 | S.41,700 E.12000 | | |
| | W-6 | -20.0 | S.46,500 E.13900 | | |
| | W-7 | -25.9 | S.53,500 E.15,000 | | |
| | W-8 | -19.7 | S.61,500 E.15,400 | | |
| | | | (Scaled from Old Town Coordinates projected on to Imperial Beach Quadrangle, Ed. 1967). | | |
| | W-9 | -16.5 | S.66,300 E.15,600 | | |
| | W10 | -19.5 | S.70,000 E.17,000 | | |
| | W11 | -24.2 | S.78,000 E.18,600 | | |

REMARKS The three sample jars from each location were randomly marked A, B, or Grain Size. Each is a separate sample. Elevation by means of lead line and tide chart.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLE & TARE NO. | | | | | | | | | |
| WET WT. +TARE | | | | | | | | | |
| DRY WT. +TARE | | | | | | | | | |
| WT. WATER | | | | | | | | | |
| WT. TARE | | | | | | | | | |
| DRY WT. | | | | | | | | | |
| % WATER | | | | | | | | | |

SPL Form 8, Feb 71 PREV EDITIONS ARE OBSOLETE

DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
LABORATORY

# SAN DIEGO HARBOR

# ANALYSIS OF BOTTOM SEDIMENTS

SAUSALITO, CALIFORNIA
March, 1973

SAN DIEGO HARBOR

ANALYSIS OF BOTTOM SEDIMENTS

March 1973

AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544, No. CIV-73-46 (SPLED-FG-13), 29 December 1972, from the Los Angeles District.

PURPOSE AND SCOPE

2. The purpose of this study was to determine the quantities of specified pollutants in samples of bottom sediments from six locations in San Diego Harbor.

SAMPLES

3. Bottom sediment samples were received in glass jars on 19 December 1972. These represented material from six core samples. Locations of the core samples are shown in Tables 1 and 2.

TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, lead, zinc, copper, cadmium, chromium and nickel were determined according to "Chemistry Laboratory Manual, Bottom Sediments" compiled by Great Lakes Region Committee on Analytical Methods and published by the Environmental Protection Agency (EPA), Federal Water Quality Administration, December 1969.

b. Mercury, EPA Provisional Method for Mercury in Sediment, Cold Vapor Technique.

c. Arsenic, Method 105A of "Standard Methods for Examination of Water and Wastewater," 13th Edition 1971, published jointly by American Public Health Association, American Waterworks Association, and Water Pollution Control Federation.

d. Total phosphorus, Standard Methods, 13th Edition, Method 223E.

e. Sulfide, Standard Methods, 13th Edition, Method 228B. The samples were not treated in the field so only the fixed sulfide was determined.

f. Chlorinated hydrocarbon pesticides and polychlorinated biphenyls, Federal Water Pollution Control Administration, 1969.

g. Particle size, Engineer Manual EM 1110-2-1906.

## TEST RESULTS

5. Data are presented as follows:

a. Tables 1 and 2 identify the samples and show the results of the analyses. The ingredients are shown as percent of dry weight of samples, as $1X10^{-4}$ percent (or parts per million) of dry weight or parts per billion ($1X10^{-7}$ percent) of dry weight.

1 part per million (ppm) = $1X10^{-4}$ percent
1 ppm = 0.0001 percent
1 percent = 10,000 ppm
1 part per billion (ppb) = $1X10^{-7}$ percent
1 percent = 10,000,000 ppb

b. ENG Forms 2087 (Plates 1 - 4) show gradation curves of the samples.

## COMMENTS

6. The following comments are made:

a. EPA maximum limits were exceeded as follows:

(1) The sample from Hole E11G exceeded the limits for volatile solids, COD, Kjeldahl nitrogen, oil and grease, mercury, lead and zinc. (All EPA limits listed).

(2) The 0- to 2-foot depth of Hole E12G failed all seven EPA limits.

(3) The sample from Hole E12H exceeded six of the EPA limits and equalled the limit for lead.

(4) The 0- to 4-foot depth sample from Hole E13G exceeded the limits for volatile solids, COD, Kjeldahl nitrogen, oil and grease, mercury and zinc.

(5) The composite sample, 0- to 5.3-foot depth of Hole E13G exceeded the limit for zinc.

(6) The sample from Hole E13H exceeded the limit for zinc.

b. There was insufficient sample to make a full composite from Hole E12G as requested.

c. No settleability tests were run as the samples were too small.

TABLE 1

SAN DIEGO HARBOR
ANALYSIS OF BOTTOM SEDIMENTS

| Hole No. | E11G | E12G | | E12H | E12J | EPA Max. Limits |
|---|---|---|---|---|---|---|
| Location | S 26,250<br>E 15,850 | S 27,500<br>E 16,700 | | S 27,500<br>E 16,800 | S 26,950<br>E 16,150 | |
| Ground Elevation, ft. | -37.0 | -31.3 | | -28.4 | -29.9 | |
| Date Sampled, 1972 | 11 Dec. | -- | | 13 Dec. | 14 Dec. | |
| Depth, feet | 0-4.7 | 0-2 | 2-3 | 0-4.5 | 0-5.2 | |
| Laboratory No. | Pc-555 | Pc-556 | Pc-557 | Pc-558 | Pc-559 | |
| Moisture content, % dry wt. | 111.4 | 102.8 | 31.4 | 85.1 | 64.1 | |
| Volatile solids, % dry wt. | 7.7 * | 7.3 * | 3.0 | 6.4 * | 5.2 | 6.0 |
| Chemical oxygen demand (COD), % dry wt. | 7.4 * | 6.9 * | 1.5 | 5.5 * | 3.4 | 5.0 |
| Total Kjeldahl nitrogen, % dry wt. | 0.21* | 0.16* | 0.04 | 0.14* | 0.08 | 0.10 |
| Oil and grease, % dry wt. | 0.48* | 0.32* | 0.02 | 0.27* | 0.09 | 0.15 |
| **Heavy Metals** | | | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 2.6 * | 2.2 * | 0.3 | 1.2 * | 0.8 | 1.0 |
| Lead (Pb), $1X10^{-4}$ % dry wt. | 138 * | 59 * | 12 | 50 | 31 | 50 |
| Zinc (Zn), $1X10^{-4}$ % dry wt. | 160 * | 117 * | 27 | 104 * | 65 * | 50 |
| Cadmium (Cd), $1X10^{-4}$ % dry wt. | 3.0 | 2.3 | 0.7 | 1.9 | 1.3 | |
| Copper (Cu), $1X10^{-4}$ % dry wt. | 95 | 82 | 9 | 60 | 28 | |
| Chromium (Cr), $1X10^{-4}$ % dry wt. | 116 | 93 | 15 | 80 | 45 | |
| Arsenic (As), $1X10^{-4}$ % dry wt. | 0.6 | 1.1 | 1.1 | 0.7 | 1.2 | |
| Nickel (Ni), $1X10^{-4}$ % dry wt. | 41 | 33 | 16 | 26 | 18 | |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | 452 | 421 | 190 | 335 | 290 | |
| Sulfide (S), $1X10^{-4}$ % dry wt. | 615 | 130 | 6 | 171 | 31 | |
| **Chlorinated Hydrocarbon Pesticides** | | | | | | |
| DDE ppb dry wt. | - | - | - | 0.20 | - | |
| pp'DDT ppb dry wt. | - | 1.48 | 0.54 | 0.76 | - | |
| **Polychlorinated Biphenyl, PCB** | | | | | | |
| Aroclor 1254, ppb dry wt. | 137 | 110 | 80 | 83 | 32 | |

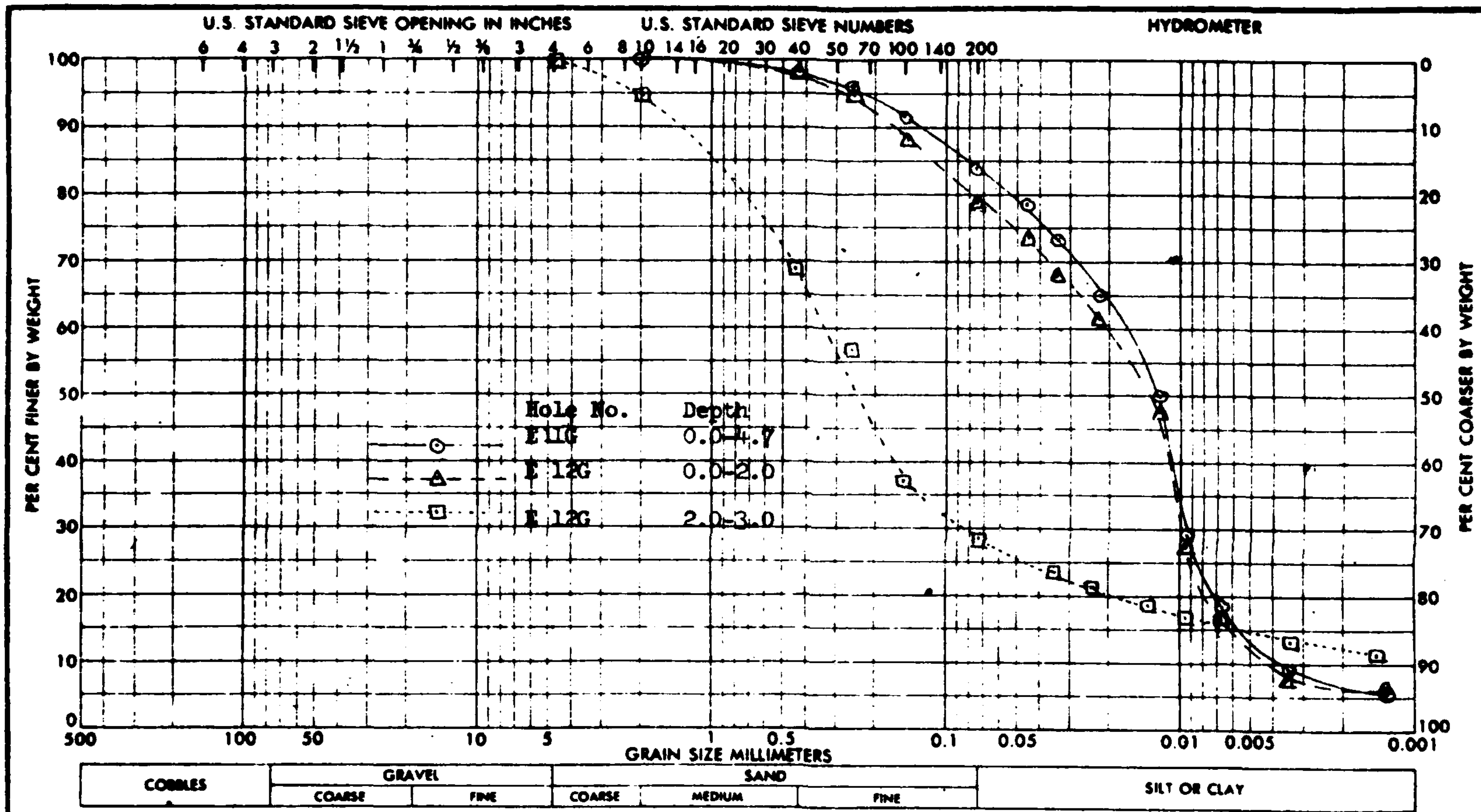
*Exceeds EPA maximum limits.

TABLE 2

SAN DIEGO HARBOR
ANALYSIS OF BOTTOM SEDIMENTS

| | | | | | | |
|---|---|---|---|---|---|---|
| Hole No. | E13G | | | | E13H | |
| Location | S 29,450 E 17,850 | | | | S 30,450 E 18,250 | EPA Max. Limits |
| Ground Elevation, ft. | -28.8 | | | | -27.7 | |
| Date Sampled, 1972 | 13 Dec. | | | | 14 Dec. | |
| Depth, feet | 0-4.0 | 4.0-5.3 | 6.2-6.6 | 0-5.3 | 0-7.5 | |
| Laboratory No. | Pc-560 | Pc-561 | Pc-562 | Pc-563 | Pc-564 | |
| Moisture content, % dry wt. | 96.1 | 39.0 | 22.2 | 70.1 | 72.3 | |
| Volatile solids, % dry wt. | 7.3 * | 3.0 | 1.7 | 5.6 | 5.9 | 6.0 |
| Chemical oxygen demand (COD), % dry wt. | 5.9 * | 1.6 | 0.2 | 3.9 | 3.8 | 5.0 |
| Total Kjeldahl nitrogen, % dry wt. | 0.14* | 0.04 | 0.01 | 0.10 | 0.10 | 0.10 |
| Oil and grease, % dry wt. | 0.18* | 0.01 | 0.01 | 0.10 | 0.10 | 0.15 |
| **Heavy Metals** | | | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 1.0 | 0.3 | 0.1 | 0.1 | 0.1 | 1.0 |
| Lead (Pb), $1X10^{-4}$ % dry wt. | 37 | 11 | 4 | 30 | 30 | 50 |
| Zinc (Zn), $1X10^{-4}$ % dry wt. | 106 * | 32 | 27 | 60 * | 77 * | 50 |
| Cadmium (Cd), $1X10^{-4}$ % dry wt. | 2.0 | 0.7 | 0.5 | 1.2 | 1.2 | |
| Copper (Cu), $1X10^{-4}$ % dry wt. | 50 | 10 | 10 | 30 | 38 | |
| Chromium (Cr), $1X10^{-4}$ % dry wt. | 65 | 20 | 17 | 47 | 54 | |
| Arsenic (As), $1X10^{-4}$ % dry wt. | 0.6 | 0.6 | 0.1 | 0.6 | 0.7 | |
| Nickel (Ni), $1X10^{-4}$ % dry wt. | 24 | 11 | 14 | 16 | 23 | |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | 395 | 206 | 376 | 321 | 331 | |
| Sulfide (S), $1X10^{-4}$, % dry wt. | 55 | 7 | 2 | 15 | 8 | |
| **Chlorinated Hydrocarbon Pesticides** | | | | | | |
| DDE, ppb dry wt. | - | - | 0.07 | - | - | |
| pp'DDT, ppb dry wt. | - | 0.36 | - | - | - | |
| **Polychlorinated Biphenyls, PCB** | | | | | | |
| Aroclor 1254, ppb dry wt. | 116 | 70 | 68 | 65 | 88 | |

*Exceeds EPA maximum limits.




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT SAN DIEGO HARBOR

AREA

BORING NO E 11 G & E 12 G

DATE

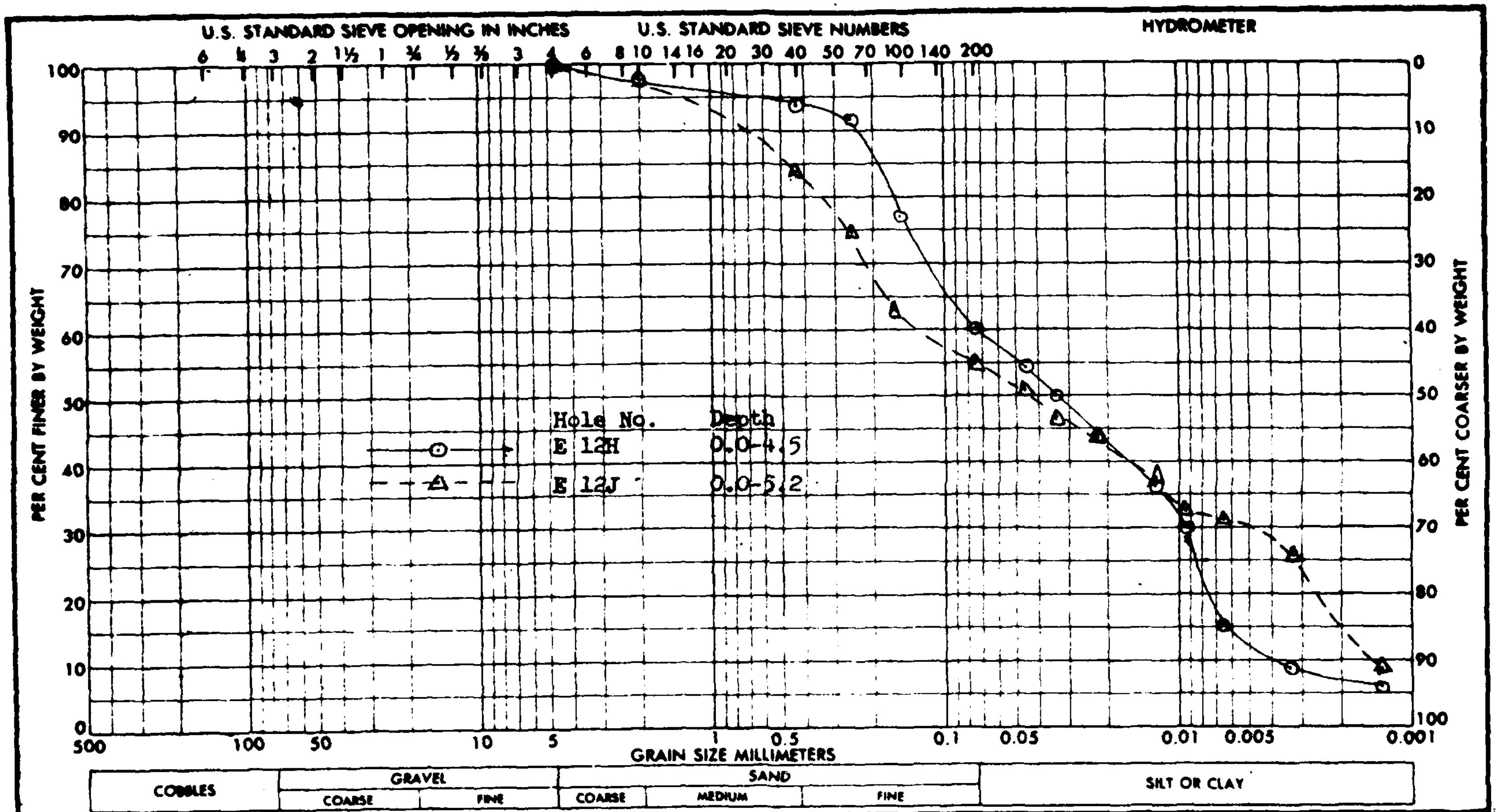
**GRADATION CURVES**

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 124, SEP 1962 WHICH IS OBSOLETE

U S GOVERNMENT PRINTING OFFICE 1963 OF—700-124

Plate 1




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PROJECT SAN DIEGO HARBOR

AREA

BORING NO E 12 H & E 12 J

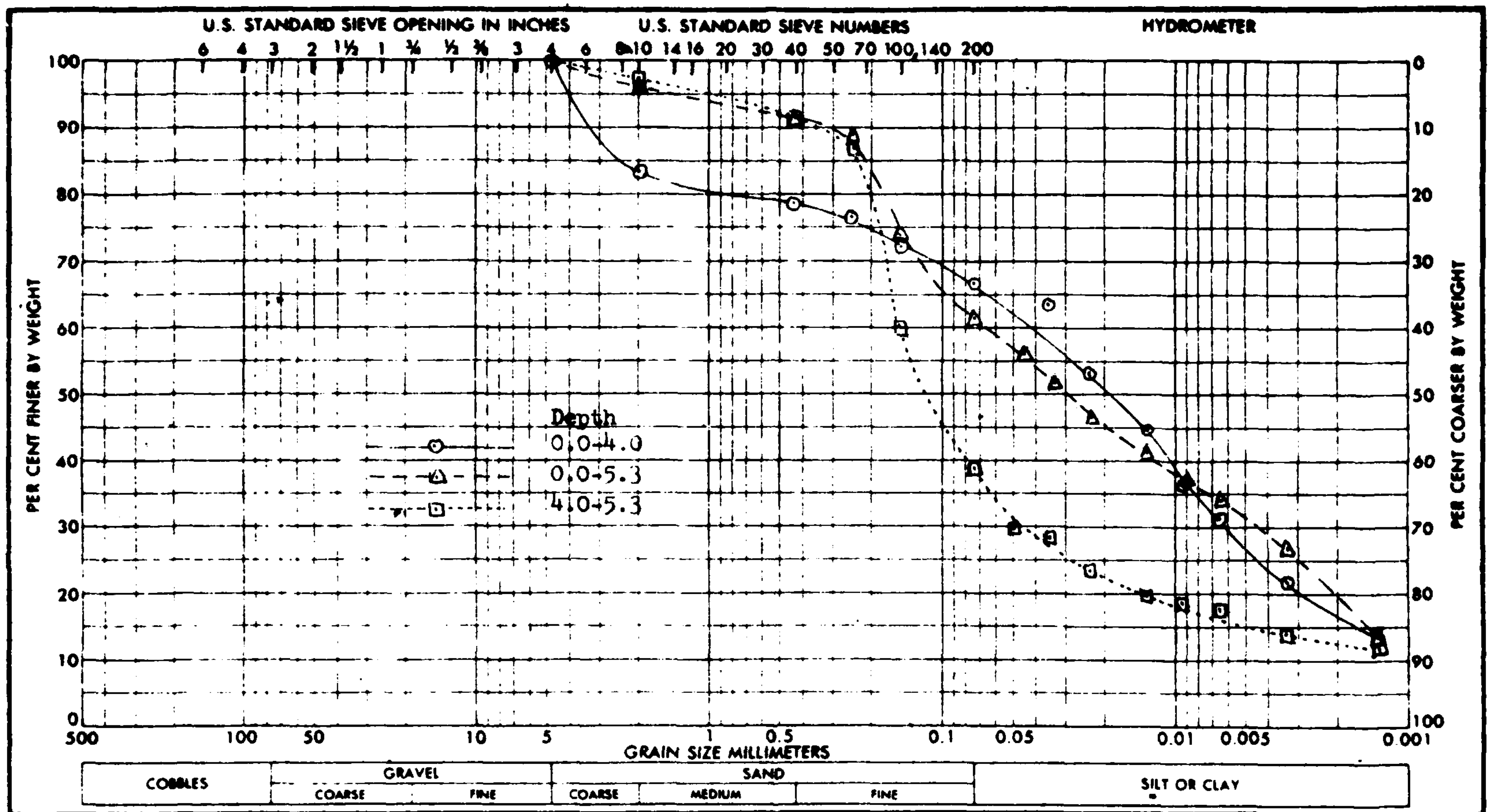
DATE

**GRADATION CURVES**

ENG FORM 2087 1 MAY 63 — REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE

U.S. GOVERNMENT PRINTING OFFICE 1963 0F—700-120

Plate 10




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PROJECT SAN DIEGO HARBOR

AREA

BORING NO E 13 G

DATE

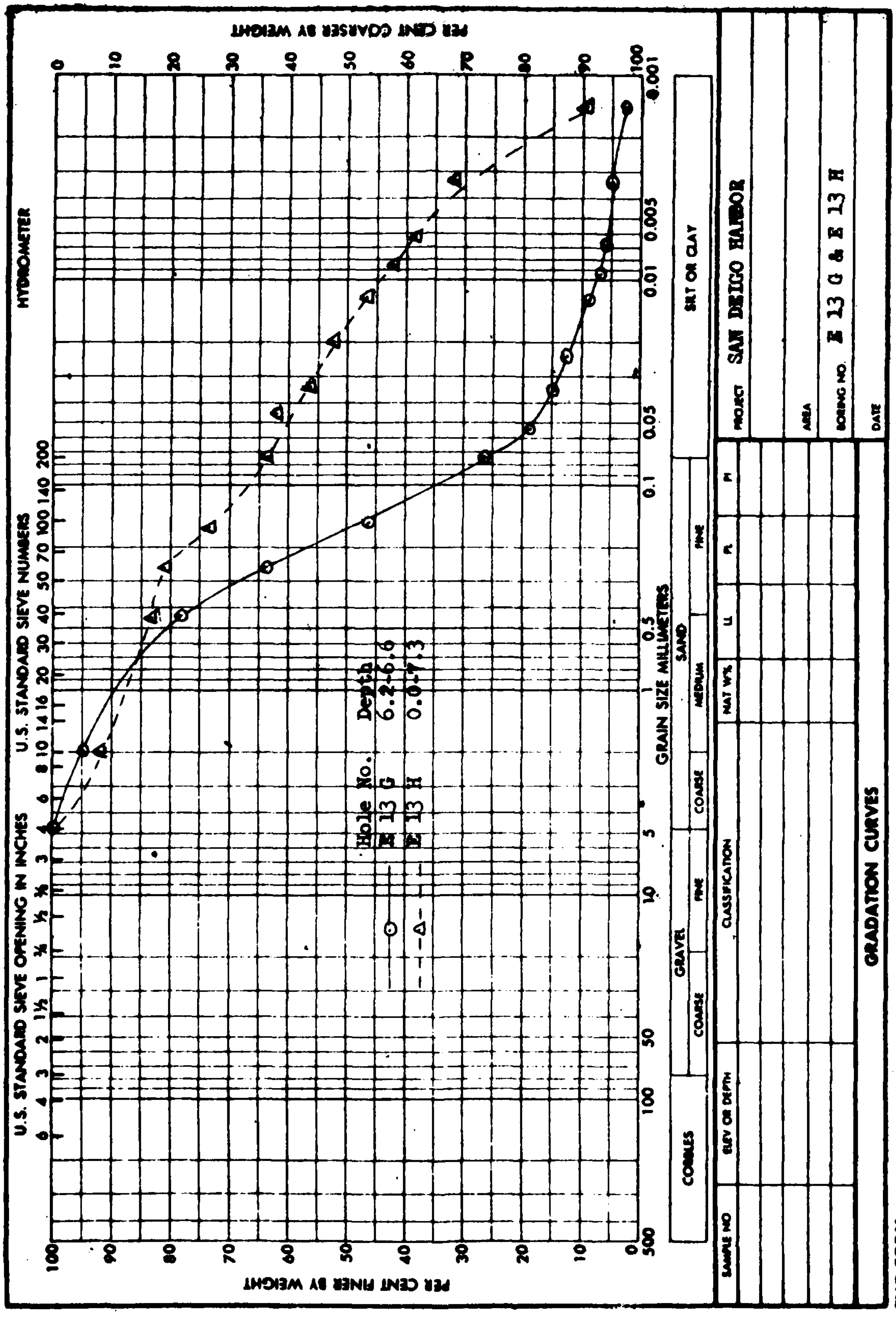
GRADATION CURVES

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241 SEP 1962 WHICH IS OBSOLETE



Plate 3



U.S. STANDARD SIEVE OPENING IN INCHES
U.S. STANDARD SIEVE NUMBERS
HYDROMETER
PER CENT FINER BY WEIGHT
PER CENT COARSER BY WEIGHT
GRAIN SIZE MILLIMETERS
COBBLES
GRAVEL
COARSE
FINE
SAND
COARSE
MEDIUM
FINE
SILT OR CLAY
Hole No. Depth
E 13 G 6.2-6.6
E 13 H 0.0-7.3
SAMPLE NO
ELEV OR DEPTH
CLASSIFICATION
NAT W%
LL
PL
PI
PROJECT SAN DEIGO HARBOR
AREA
BORING NO. E 13 G & E 13 H
DATE
GRADATION CURVES
ENG FORM 2087
1 MAY 63
REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE

DEPARTMENT OF THE ARMY

SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS

LABORATORY

# SAN DIEGO HARBOR

# ANALYSIS OF BOTTOM SEDIMENTS

SAUSALITO, CALIFORNIA

May, 1973

SAN DIEGO HARBOR

ANALYSIS OF BOTTOM SEDIMENTS

May 1973

AUTHORIZATION

1. Results of tests reported herein were requested by DA Form 2544, No. CIV-73-64, 21 March 1973, from the Los Angeles District.

PURPOSE AND SCOPE

2. The purpose of this study was to determine the quantities of specified pollutants in samples of bottom sediments and to determine the grain-size distribution of the samples.

SAMPLES

3. Bottom sediment samples were received in glass jars on 20 March 1973. These represented material from four holes. Locations of the holes are given in Tables 1 and 2.

TESTS

4. Tests were performed as follows:

a. Volatile solids, chemical oxygen demand (COD), total Kjeldahl nitrogen, oil and grease, lead, zinc, copper, cadmium, chromium and nickel were determined according to "Chemistry Laboratory Manual, Bottom Sediments" compiled by Great Lakes Region Committee on Analytical Methods and published by the Environmental Protection Agency (EPA), Federal Water Quality Administration, December 1969.

b. Mercury, EPA Provisional Method for Mercury in Sediment, Cold Vapor Technique.

c. Arsenic, Method 105A of "Standard Methods for Examination of Water and Wastewater," 13th Edition 1971, published jointly by American Public Health Association, American Waterworks Association, and Water Pollution Control Federation.

d. Total phosphorus, Standard Methods, 13th Edition, Method 223E.

e. Sulfide, Standard Methods, 13th Edition, Method 228B. The samples were not treated in the field so only the fixed sulfide was determined.

f. Chlorinated hydrocarbon pesticides and polychlorinated biphenyls, Federal Water Pollution Control Administration, 1969.

g. Particle size, Engineer Manual EM 1110-2-1906.

TEST RESULTS

5. Data are presented as follows:

a. Tables 1 and 2 identify the samples and show the results of the analyses. The ingredients are shown as percent of dry weight of samples, as $1X10^{-4}$ percent (or parts per million) of dry weight or parts per billion ($1X10^{-7}$ percent) of dry weight.

1 part per million (ppm) = $1X10^{-4}$ percent
1 ppm = 0.0001 percent
1 percent = 10,000 ppm
1 part per billion (ppb) = $1X10^{-7}$ percent
1 percent = 10,000,000 ppb

b. ENG Forms 2087 (Plates 1 - 6) show gradation curves of the samples.

COMMENTS

6. The following comments are made:

a. Four samples exceeded EPA maximum limits for zinc content, all other tests were within limits.

b. No settleability tests were run as the samples were too small.

TABLE 1

SAN DIEGO HARBOR

ANALYSIS OF BOTTOM SEDIMENTS

HOLES NOS. E6E-D AND UPD-1

| Hole No. | E6E-D | | | | UPD- |
|---|---|---|---|---|---|
| Location | S15,500 E15,750 | | | | S30,800 E1 |
| Ground Elev. ft. (MLLW) | -28.6 | | | | -12. |
| Depth, ft. | 0-2.5 | 0-1.0 | 1.0-9.0 | 9.0-17.0 | 17.0-25. |
| Laboratory No. | PC-603 | PC-586 | PC-587 | PC-588 | PC-589 |
| Moisture content, % dry wt. | 54.4 | 34.1 | 26.5 | 27.2 | 28.3 |
| Volatile solids, % dry wt. | 2.8 | 2.0 | 0.6 | 0.6 | 0.8 |
| Chemical oxygen demand (COD), % dry wt. | 1.7 | 1.4 | 0.3 | 0.3 | 0.4 |
| Total Kjeldahl nitrogen, % dry wt. | 0.05 | 0.04 | 0.01 | 0.01 | 0.01 |
| Oil and grease, % dry wt. | 0.06 | 0.03 | 0.01- | 0.01- | 0.01- |
| Heavy Metals | | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 0.5 | 0.5 | 0.2 | 0.1 | 0.2 |
| Lead (Pb), " " " " | 30 | 15 | 2 | 2 | 2 |
| Zinc (Zn), " " " " | 100 * | 61 * | 20 | 20 | 20 |
| Cadmium (Cd), " " " " | 0.5 | | 0.6 | | |
| Copper (Cu), " " " " | 93 | | 5 | | |
| Chromium (Cr), " " " " | 26 | | 7 | | |
| Arsenic (As), " " " " | 0.4 | | 0.3 | | |
| Nickel (Ni), " " " " | 29 | | 10 | | |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | 197 | | 90 | | |
| Sulfide (S), $1X10^{-4}$ % dry wt. | 145 | | 4 | | |
| Chlorinated Hydrocarbon Pesticides | - | | - | | |
| Polychlorinated Biphenyl (PCB) | | | | | |
| Aroclor 1254, ppb by wt. | 144 | | 112 | | |

*Exceeds EPA maximum limit.

TABLE 1

SAN DIEGO HARBOR

YSIS OF BOTTOM SEDIMENTS

ES NOS. E6E-D AND UPD-1

| UPD-1 S30,800 E12,300 -12.0 | | | | | | EPA Max. Limits |
|---|---|---|---|---|---|---|
| 1.0-9.0 | 9.0-17.0 | 17.0-25.5 | 25.5-32.0 | 32.0-33.3 | 33.3-40.8 | |
| PC-587 | PC-588 | PC-589 | PC-590 | PC-591 | PC-592 | |
| 26.5 | 27.2 | 28.3 | 29.4 | 19.7 | 27.5 | |
| 0.6 | 0.6 | 0.8 | 0.8 | 1.2 | 0.7 | 6.0 |
| 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.4 | 5.0 |
| 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.10 |
| 0.01- | 0.01- | 0.01- | 0.01- | 0.01- | 0.01- | 0.15 |
| 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 1.0 |
| 2 | 2 | 2 | 2 | 11 | 10 | 50 |
| 20 | 20 | 20 | 20 | 10 | 13 | 50 |
| 0.6 | | | | | | |
| 5 | | | | | | |
| 7 | | | | | | |
| 0.3 | | | | | | |
| 10 | | | | | | |
| 90 | | | | | | |
| 4 | | | | | | |
| - | | | | | | |

112

2

TABLE 2

SAN DIEGO HARBOR

ANALYSIS OF BOTTOM SEDIMENTS

HOLES NOS. UPD-2 AND UPD-3

| Hole No. | UPD-2 | | | | |
|---|---|---|---|---|---|
| Location | S31,230 E13,000 | | | | |
| Ground Elev., ft. (MLLW) | -13.1 | | | | |
| Depth, ft. | 0-0.8 | 0.8-9.7 | 9.7-17.7 | 17.7-25.6 | 25.6-37.0 |
| Laboratory No. | PC-593 | PC-594 | PC-595 | PC-596 | PC-597 |
| Moisture content, % dry wt. | 35.7 | 23.3 | 22.3 | 24.1 | 25.8 |
| Volatile solids, % dry wt. | 1.8 | 0.5 | 0.6 | 0.6 | 0.8 |
| Chemical oxygen demand (COD), % dry wt. | 1.4 | 0.2 | 0.3 | 0.2 | 0.4 |
| Total Kjeldahl nitrogen, % dry wt. | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 |
| Oil and grease, % dry wt. | 0.04 | 0.01- | 0.01- | 0.01- | 0.01- |
| **Heavy Metals** | | | | | |
| Mercury (Hg), $1X10^{-4}$ % dry wt. | 0.4 | 0.1 | 0.1 | 0.2 | 0.2 |
| Lead (Pb), " " " " | 12 | 1 | 2 | 4 | 4 |
| Zinc (Zn), " " " " | 62 * | 15 | 10 | 6 | 13 |
| Cadmium (Cd), " " " " | | 0.3 | | | |
| Copper (Cu), " " " " | | 2 | | | |
| Chromium (Cr), " " " " | | 8 | | | |
| Arsenic (As), " " " " | | 0.1 | | | |
| Nickel (Ni), " " " " | | 7 | | | |
| Total phosphorus (P), $1X10^{-4}$ % dry wt. | | 97 | | | |
| Sulfide (S), $1X10^{-4}$ % dry wt. | | 2 | | | |
| **Chlorinated Hydrocarbon Pesticides** | | | | | |
| BHC, ppb by wt. | | - | | | |
| **Polychlorinated Biphenyl (PCB)** | | | | | |
| Aroclor 1254, ppb dry wt. | | 87 | | | |

*Exceeds EPA maximum limit.

TABLE 2

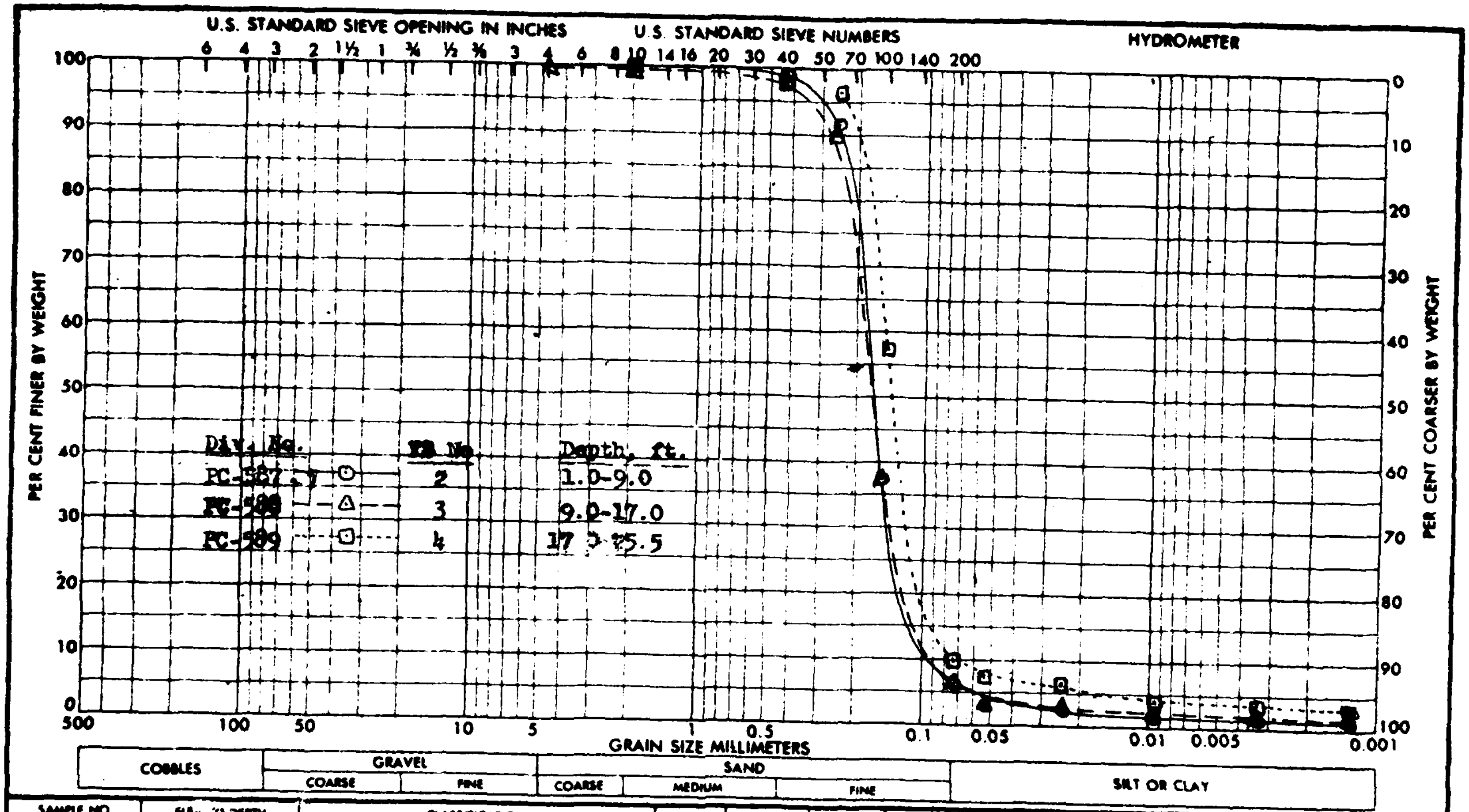
SAN DIEGO HARBOR

NALYSIS OF BOTTOM SEDIMENTS

HOLES NOS. UPD-2 AND UPD-3

| UPD-2<br>30 E13,000<br>-13.1 | | | UPD-3<br>S31,700 E12,300<br>-11.7 | | | | | EPA Max. Limits |
|---|---|---|---|---|---|---|---|---|
| -17.7 | 17.7-25.6 | 25.6-37.0 | 0-1.8 | 1.8-10.0 | 10.0-18.6 | 18.6-26.6 | 26.6-39.7 | |
| 595 | PC-596 | PC-597 | PC-598 | PC-599 | PC-600 | PC-601 | PC-602 | |
| 3 | 24.1 | 25.8 | 34.8 | 26.7 | 26.6 | 25.5 | 25.0 | |
| 6 | 0.6 | 0.8 | 1.7 | 0.6 | 0.7 | 0.7 | 1.0 | 6.0 |
| 3 | 0.2 | 0.4 | 1.4 | 0.3 | 0.3 | 0.3 | 0.3 | 5.0 |
| 01 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01- | 0.01- | 0.01- | 0.10 |
| 01- | 0.01- | 0.01- | 0.04 | 0.01- | 0.01- | 0.01- | 0.01- | 0.15 |
| 1 | 0.2 | 0.2 | 0.4 | 0.3 | 0.2 | 0.2 | 0.1 | 1.0 |
| | 4 | 4 | 22 | 2 | 5 | 4 | 8 | 50 |
| | 6 | 13 | 66 * | 13 | 15 | 11 | 12 | 50 |
| | | | 0.4 | | | | | |
| | | | 15 | | | | | |
| | | | 40 | | | | | |
| | | | 0.7 | | | | | |
| | | | 20 | | | | | |
| | | | 139 | | | | | |
| | | | 11 | | | | | |
| | | | 8 | | | | | |
| | | | 112 | | | | | |

2




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |

**GRADATION CURVES**

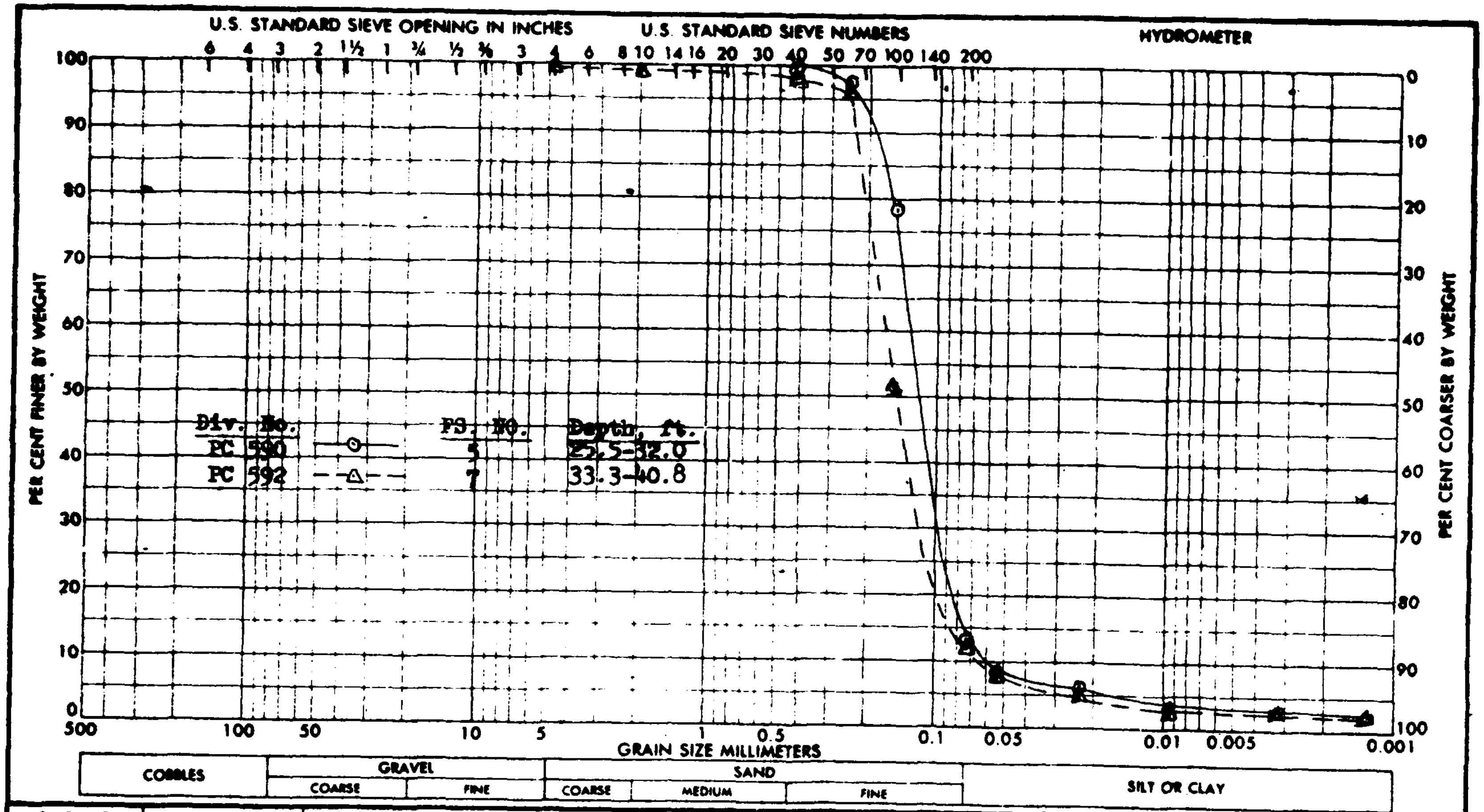
PROJECT SAN DIEGO RIVER

AREA

BORING NO UPD 1

DATE

ENG FORM 2087, 1 MAY 63 — REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT SAN DIEGO RIVER

AREA

BORING NO UPD 1

DATE

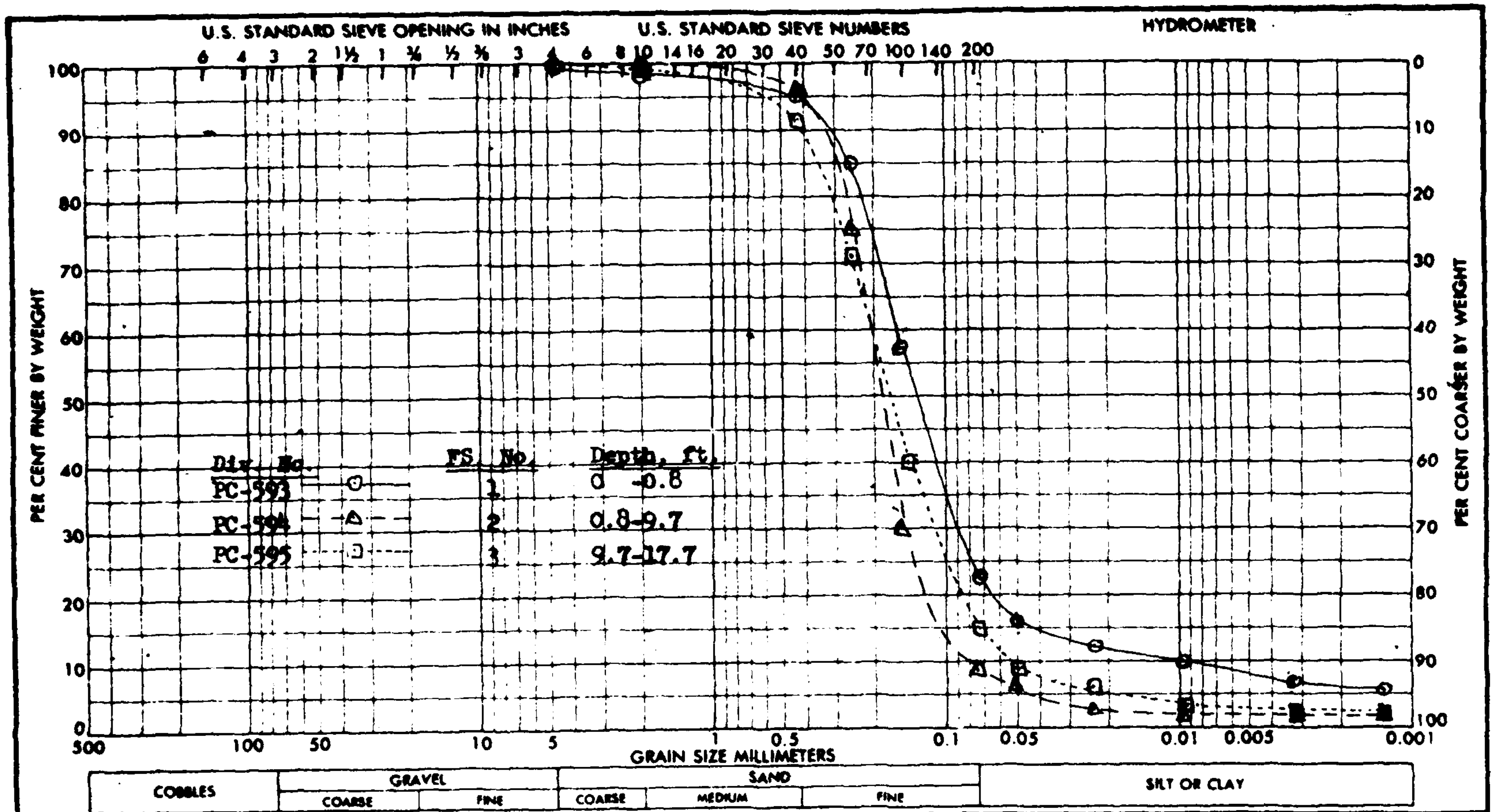
GRADATION CURVES

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE.

U S GOVERNMENT PRINTING OFFICE 1963 OF—700-120

Plate 2




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |
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PROJECT SAN DIEGO RIVER

AREA

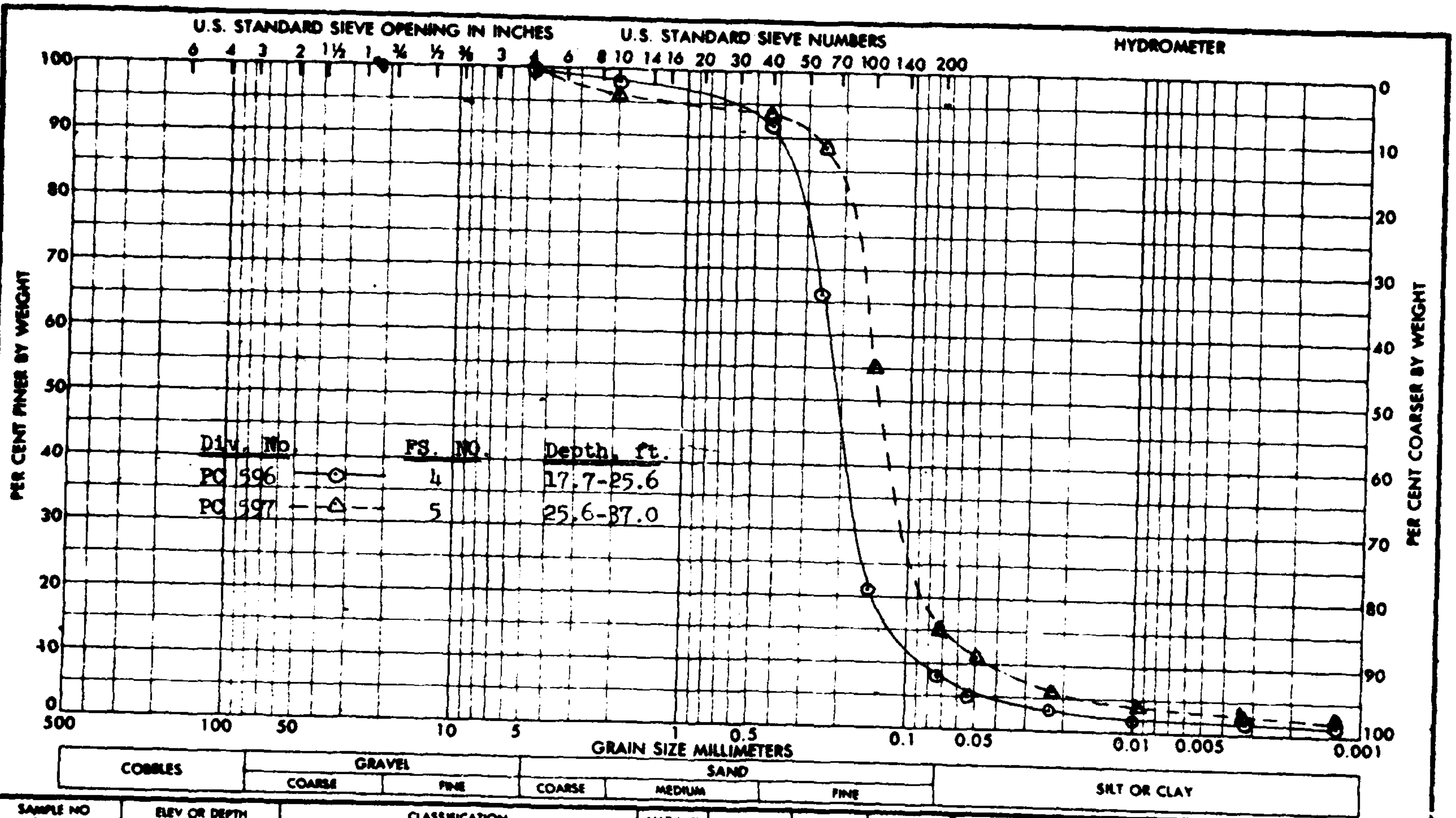
BORING NO UPD 2

DATE

## GRADATION CURVES

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |
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PROJECT SAN DIEGO RIVER

AREA

BORING NO UPD 2

DATE

**GRADATION CURVES**

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE.

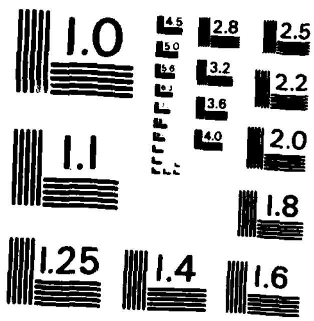
U S GOVERNMENT PRINTING OFFICE 1963 OF—700-158

Plate 4

AD A136 672 NAVIGATION IMPROVEMENT DESIGN MEMORANDUM NUMBER 1
GENERAL DESIGN FOR SAN..(U) ARMY ENGINEER DISTRICT LOS
ANGELES CA FEB 75

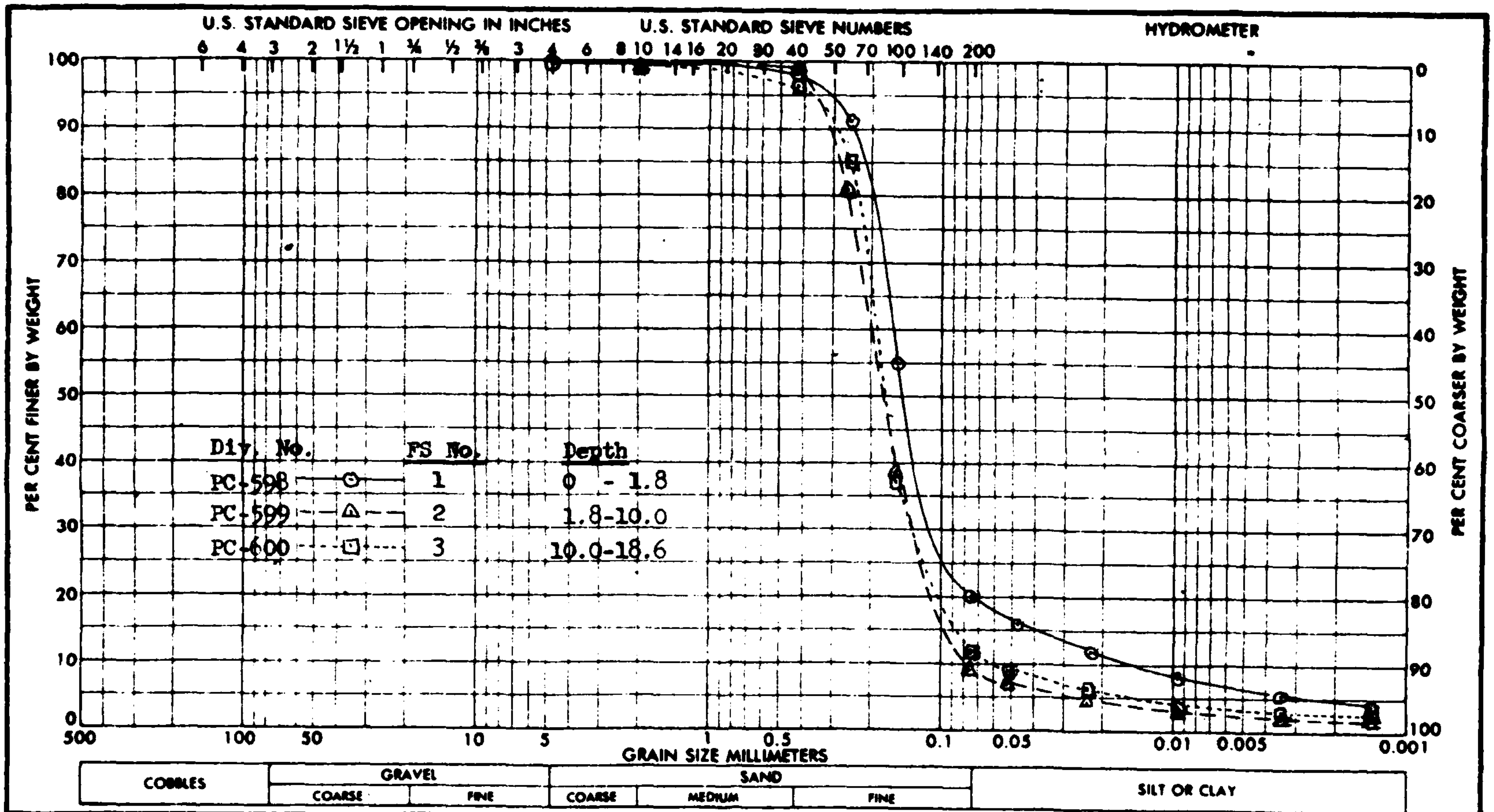
2/4

UNCLASSIFIED F/G 13/2 NL




MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT SAN DIEGO RIVER

AREA

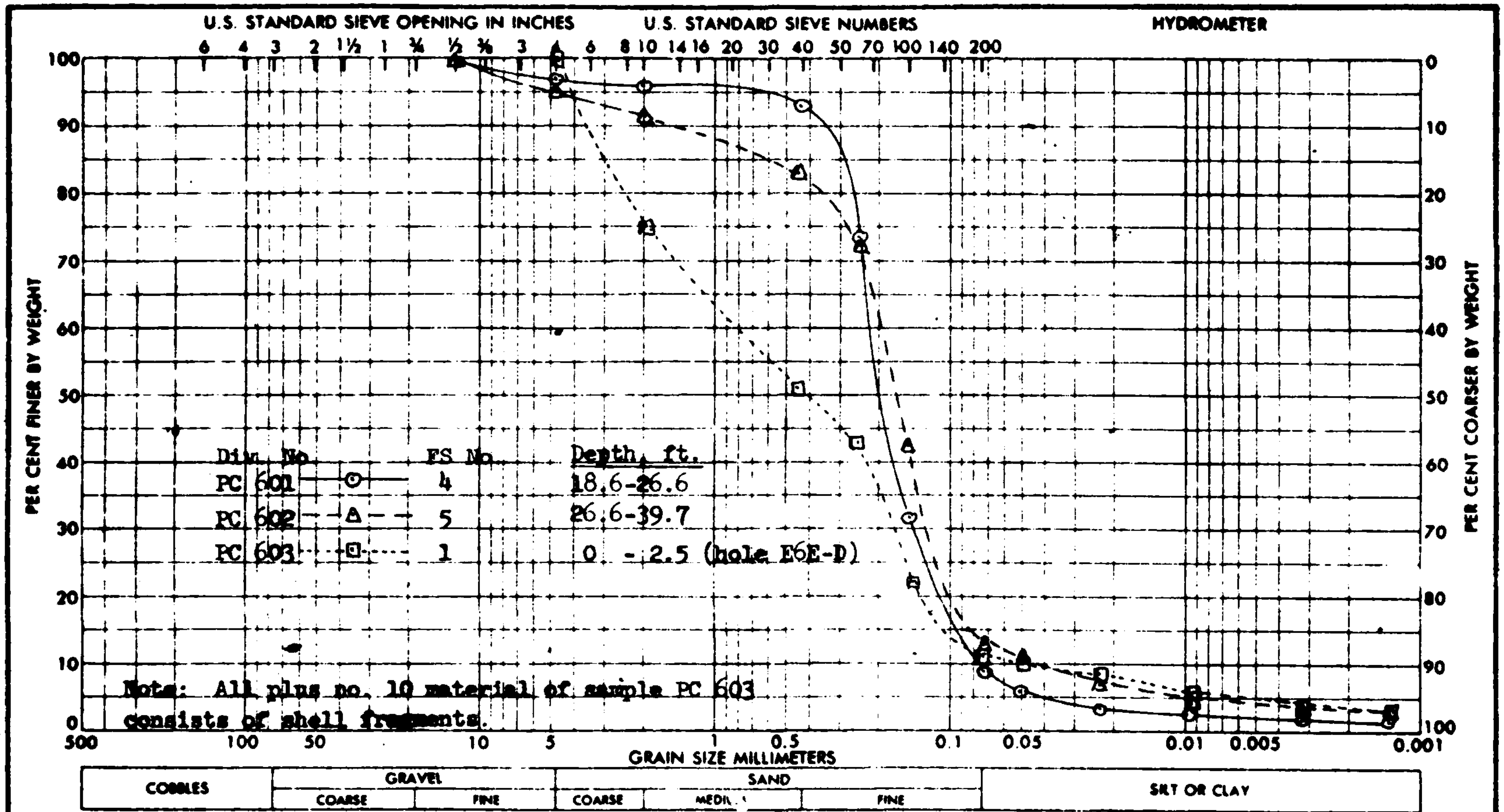
BORING NO UPD 3

DATE

**GRADATION CURVES**



Plate 5




| SAMPLE NO | ELEV OR DEPTH | CLASSIFICATION | NAT W% | LL | PL | PI |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PROJECT SAN DIEGO RIVER

AREA

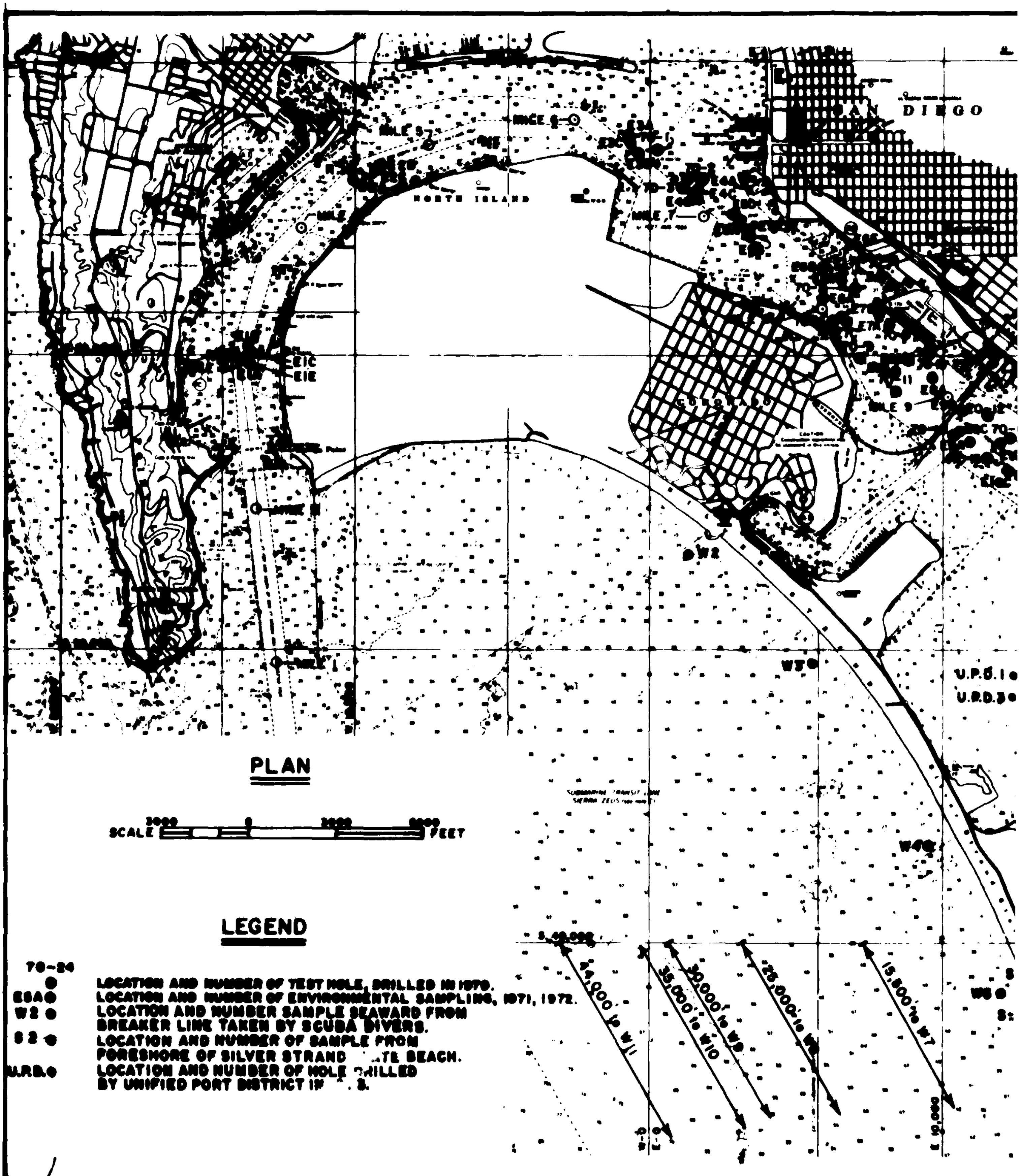
BORING NO UPD 3 & E6E-D

DATE

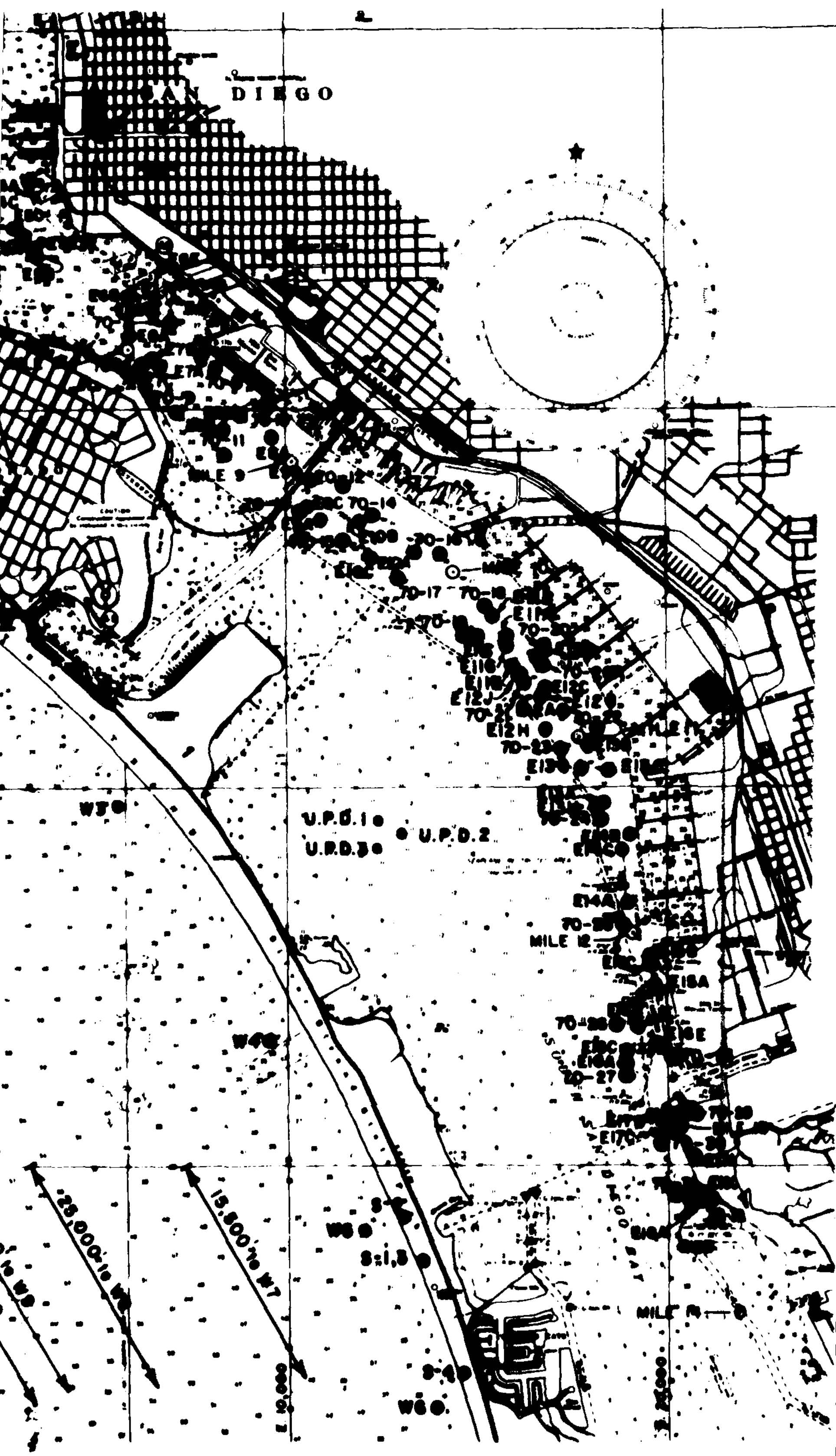
**GRADATION CURVES**

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO 1241, SEP 1962, WHICH IS OBSOLETE



SAN DIEGO
NORTH ISLAND
MILE 6
MILE 7
MILE 9
EIC
EIE
W2
W3
W4
W5
U.P.D.1
U.P.D.3
44,000 to W11
35,000 to W10
30,000 to W9
25,000 to W8
15,500 to W7
PLAN
SCALE 3000 0 3000 6000 FEET
LEGEND
70-24 LOCATION AND NUMBER OF TEST HOLE, DRILLED IN 1970.
ESA LOCATION AND NUMBER OF ENVIRONMENTAL SAMPLING, 1971, 1972.
W2 LOCATION AND NUMBER SAMPLE SEAWARD FROM BREAKER LINE TAKEN BY SCUBA DIVERS.
S2 LOCATION AND NUMBER OF SAMPLE FROM FORESHORE OF SILVER STRAND ATE BEACH.
U.P.D. LOCATION AND NUMBER OF HOLE DRILLED BY UNIFIED PORT DISTRICT IN




**NOTES:**

1. PLAN IS A REDUCTION OF PART OF COAST AND GEODETIC SURVEY CHART 5107 EDITION OF APRIL 11, 1970.
2. DATUM IS MEAN LOWER LOW WATER.
3. CORPS OF ENGINEERS LOCAL GRID SYSTEM IS INDICATED AT 10,000 FOOT INTERVALS.
4. HOLES 70-4 AND 70-5 WERE NOT DRILLED BECAUSE OF PIPE AND CABLE CROSSING AT PROPOSED LOCATIONS.

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

FILE NO. D-788 PLATE 1-1

U.S. ARMY ENGINEER DISTRICT

## LEGEND

| | |
|---|---|
| -25.8 | ELEVATION BELOW MEAN LOWER LOW WATER, DETERMINED FROM TIDE TABLE AND MEASUREMENTS. |
| LL | LIQUID LIMIT |
| PI | PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT) |
| NP | NONPLASTIC |
| 4 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE |
| -200 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SIEVE. |
| .005 | PERCENT OF MATERIAL FINER THAN .005 MILLIMETERS. |
| N | NUMBER OF BLOWS OF A 140 POUND DROPHAMMER FALLING 30 INCHES REQUIRED TO DRIVE A SAMPLING SPOON ONE FOOT. OUTSIDE DIAMETER OF SPOON IS 2 INCHES: INSIDE DIAMETER IS 1-3/8 INCHES PROCEDURE IS CALLED STANDARD PENETRATION TEST. |
| * | PARTICLE SIZE DISTRIBUTION OF SAMPLE FOR CHEMICAL TESTS. |

NOTES:

1. Holes U.P.D. 1, 2, and 3 were drilled in March 1973 by the Unified Port District to determine character and environmental test qualities of material in an area considered for specialized spoil disposal. The Corps of Engineers sampled materials as they were recovered and made the environmental tests as shown in Report 1-5.

2. Continous sampling was done by driving a sampling spoon, recovering the sample, deepening and casing the hole to the depth sampled and repeating the sequence. Environmental test samples were taken by cutting open cores, putting material from the center into glass jars with aluminum foil protected covers and icing them immediately. Samples for classification tests and sieve analysis were taken from material remaining after using the central part of the core for environmental test samples, each was nonplastic.

3. Complete particle size determinations were made on most environmental samples used for chemical tests.

4. E.P.A. Ocean Dumping Criteria published 16 May 73 in the Federal Register Vol 38 No. 94, Part II, pages 12871 to 12876 supersede the limits shown in note 6. The new criteria reflect the strong reservations within the scientific community to the use of chemical composition of spoil material as the sole indicator of pollution status.

### U.P.D.-1

| El. (Depth) | Soils Class | -10 | -40 | -100 | -200 | .02 | .005 | Description |
|---|---|---|---|---|---|---|---|---|
| -12.0 (0.0) | | | | | | | | |
| -13.0 (1.0) | SM | 97 | 78 | 57 | 28 | | | Silty sand, fine, dark grey. Zn was 61 p.p.m., the other six test results of the minimum series were lower than E.P.A. limits of 1971. |
| | SP/SM | 100 | 91 | 50 | 6 | | | Sand and silty sand, fine, light gray, occasional streaks of shell fragments. All test results of the minimum series were lower than the E.P.A. limits of 1971. Results of Maximum Series Tests are given in Report 1-5. |
| -21.0 (9.0) | * | 100 | 91 | 38 | 6 | 3 | 2 | |
| | SM | 100 | 92 | 46 | 23 | | | Sand and silty sand, fine light gray, occasional streaks of shell fragments. All test results of the minimum series were lower than E.P.A. limits of 1971. |
| -29.0 (17.0) | * | 99 | 90 | 38 | 6 | 3 | 2 | |
| | SP/SM | 99 | 97 | 60 | 11 | | | Sand and silty sand, fine, light gray. All test results of the minimum series were lower than E.P.A. limits of 1971 |
| -37.5 (25.5) | * | 100 | 97 | 58 | 10 | 7 | 3 | |
| | SM | 100 | 98 | 80 | 19 | | | Sand and silty sand, fine, light gray with some alternating layers of light and dark gray. All test results of minimum series were lower than E P A limits of 1971 |
| -44.0 (32.0) | * | 100 | 98 | 78 | 13 | 7 | 3 | |
| -45.3 (33.3) | SM | 86 | 50 | 25 | 16 | | | Silty sand and shells, fine, gray. All test results of the minimum series were lower than the E P A limits of 1971 |
| | SP/SM | 99 | 86 | 56 | 12 | | | Sand and silty sand, fine, light gray, one streak of shell fragments. All test results of the minimum series were lower than EPA limits of 1971. |
| -52.0 (40.0) | * | 99 | 96 | 52 | 12 | 7 | 3 | |
| -56.0 (44.0) | NO TEST SAMPLE, EXAMINED MATERIALS IN ROTARY DRILL RETURN WATER. | | | | | | | Sand, and silty sand, fine, light gray, with a few shells |
| -60.0 (48.0) | | | | | | | | Sand and silty sand, fine, light gray |

### U.P.D.-3

| El. (Depth) | Soils Class | -10 | -40 | -100 | -200 | .02 | .005 | Description |
|---|---|---|---|---|---|---|---|---|
| -11.7 (0.0) | | | | | | | | |
| -13.5 (1.8) | SM | 98 | 90 | 59 | 26 | | | Silty sand, fine, dark gray, with shells. Zn was 66p.p.m. The other six test results of the minimum series were lower than E.P.A. limits of 1971. Results of Maximum Series Tests are in Report 1-5 |
| | * | 99 | 91 | 55 | 20 | 13 | 7 | |
| | SP/SM | 100 | 86 | 44 | 11 | | | Sand and silty sand, fine, light gray to brown. All results of minimum series of tests were lower than E.P.A. limits of 1971. |
| -21.7 (10.0) | * | 100 | 81 | 39 | 9 | 5 | 3 | |
| | SP/SM | 99 | 86 | 46 | 21 | | | Sand and silty sand, fine, light gray, with shell fragments. All results of minimum series of tests were lower than E P.A limits of 1971. |
| -30.3 (18.6) | * | 100 | 85 | 37 | 12 | 7 | 3 | |
| | SP/SM | 98 | 79 | 41 | 11 | | | Sand and silty sand, fine, light gray with a few shells. All results of minimum series of tests were lower than E P A limits of 1971 |
| -38.3 (26.6) | * | 97 | 73 | 32 | 8 | 3 | 2 | |
| | SP/SM | 97 | 80 | 53 | 24 | | | Sand and silty sand, fine, light gray, abundant shell fragments. All results of minimum series of tests were lower than E P A limits of 1971 |
| -51.4 (39.7) | * | 92 | 72 | 43 | 13 | 7 | 4 | |
| -57.7 (46.0) | NO SAMPLE Examined material in rotary drill return water. | | | | | | | Sand and silty sand, fine, gray, abundant shell fragments |
| -61.7 (50.0) | | | | | | | | Silty sand, fine brown |

### U.P.D.-2

| El. (Depth) | Soils Class | -10 | -40 | -100 | -200 | .02 | .005 | Description |
|---|---|---|---|---|---|---|---|---|
| -13.1 (0.0) | | | | | | | | |
| -13.8 (0.8) | SM | 99 | 88 | 64 | 19 | | | Silty sand, fine, soft, gray with a few shells. Zn was 62 p p m. The other six basic test results were lower than E.P.A. limits of 1971 |
| | * | 98 | 85 | 57 | 23 | 13 | 8 | |
| | SM | 100 | 77 | 32 | 15 | | | Silty sand and sand, fine, with shell fragments. All results of minimum series of tests were lower than E.P.A. limits of 1971. Results of Maximum Series Tests are given in Report 1-5 |
| -22.8 (9.7) | * | 100 | 75 | 30 | 9 | 3 | 2 | |
| | SM | 99 | 72 | 42 | 14 | | | Silty sand, fine, gray, with shells. All results of minimum series of tests are lower than E P A limits of 1971 |
| -30.8 (17.7) | * | 99 | 71 | 40 | 15 | 6 | 3 | |
| | SP/SM | 98 | 69 | 22 | 11 | | | Silty sand and sand, fine, light gray with shells. All results of minimum series of tests are lower than the E P A limits of 1971 |
| -38.7 (25.6) | * | 98 | 66 | 21 | 8 | 3 | 2 | |
| | SM | 97 | 88 | 60 | 16 | | | Silty sand and sand, fine, gray, with shells. All results of minimum series of tests are lower than E P A limits of 1971 |
| -50.1 (37.0) | * | 96 | 89 | 55 | 15 | 7 | 3 | |
| -63.1 (50.0) | NO SAMPLE Examined material in rotary drill return water. | | | | | | | Silty sand and sand, fine gray to light gray, with shells |

### 70-1

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -36.7 (0.0) | SP | 100 | 98 | 60 | 3 | | NP | 10 | Sand, fine to coarse, gray brown, with shells |
| -42+1' O.D. C.O.D. / -45.9 (6.0) | | 100 | 99 | 81 | 1 | | NP | | |
| -47.9 (11.2) | | | | | | | | | |

Tip of penetrometer spoon went 2.0 foot without driving. Set 51 foot of 8" casing to Elevation -46.6; casing pulled out easily. Drilled 11 Nov 70.

### 70-2

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -39.4 (0.0) | SP | 98 | 87 | 52 | 3 | | NP | 13 | Sand, fine to coarse, gray and gray-brown, with shells |
| -42+1' O.D. C.O.D. / -45.9 (6.0) | SP/SM | | 100 | 99 | 5 | | NP | | Sand, fine, gray |
| -49.4 (10.0) | | | | | | | | | |

Tip of penetrometer spoon went 3.3 foot without driving. Set 51 foot of 8" casing to Elevation -40; casing pulled out easily. Drilled 11 Nov 70.

### 70-3

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -36.4 (0.0) | SP | 99 | 88 | 63 | 2 | | NP | 7 | Sand, fine to coarse, gray, with shells. Drilling needed through coarse sand and shells, remainder jetted easily |
| -42+1' O.D. C.O.D. / -48.1 (11.7) | | 100 | 99 | 83 | 2 | | NP | | Sand, fine, gray |
| -53.6 (17.2) | | | | | | | | | |

Tip of penetrometer spoon went 0.9 foot without driving. Set 51 foot of 8" casing to Elevation -46.5; casing pulled out easily. Drilled 11 Nov 70.

70 4 AND 70 5 NOT DRILLED BECAUSE OF PIPE AND CABLE CROSSING AT PROPOSED LOCATION.

### 70-6

| El. (Depth) | Class | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -33.3 (0.0) | SM | | 100 | 96 | 53 | 37 | | NP | 10 | Sand, fine to coarse, gray with shells. Drilling was needed through coarse sand and shells, remainder jetted easily |
| -40+1' O.D. C.O.D. / -42.3 (9.0) | | | | | | | | | | |
| -45.4 (11.9) | SP | | 100 | 99 | 90 | 7 | | NP | | Sand, fine to medium, gray, shells |
| -46.0 (12.7) | SM | 100 | 95 | 75 | 35 | 12 | | NP | | Silty sand, gray, shells and gravel lens, drilling needed |
| -48.0 (14.7) | SC | 92 | 75 | 75 | 60 | 35 | 70 | 51 | | Sandy clay, gray, drilling needed |

Tip of penetrometer spoon went 2.2 foot without driving. Set 51 foot of 8" casing to Elevation -44.6; casing pulled out easily. Drilled 10 Nov 70.

### 70-7

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -38.0 (0.0) | SP | 100 | 99 | 70 | 3 | | NP | 10 | Sand, fine to coarse, with shells, streak of sandy silt |
| -40+1' O.D. C.O.D. / -46.7 (8.8) | SP/SM | | 100 | 95 | 8 | | NP | | Sand, fine, gray, micaceous |
| -48.4 (8.8) | SP | | 100 | 98 | 4 | | NP | | Sand, fine, light gray |
| -53.1 (15.3) | | | | | | | | | |

Tip of penetrometer spoon went 3.0 foot without driving. Set 46 foot of 8" casing to Elevation -40.5; casing pulled out easily. Drilled 10 Nov 70.

### 70-8

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -38.9 (0.0) | SP | | 100 | 82 | 3 | | NP | | Sand, fine, light gray |
| C.O.D. -40+1' O.D. / -40.9 (4.0) | SP/SM | | 100 | 94 | 8 | | NP | 6 | Silty sand, fine, dark gray, micaceous |
| -45.8 (8.9) | | 100 | 99 | 67 | 8 | | NP | | |
| -47.7 (10.8) | SC | | 100 | 82 | 60 | 31 | 15 | | Sandy silt, fine, brown, drilling needed |
| -53.0 (16.1) | | | | | | | | | |

Tip of penetrometer spoon went 3.1 foot without driving. Set 56 foot of 8" casing to Elevation -40.8; casing was hard to pull but did not need reverse driving. Drilled 12 Nov 70.

### 70-9

| El. (Depth) | Class | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -40.2 (0.0) | SP | 100 | 98 | 67 | 2 | | NP | 15 | Sand, fine to medium, gray, with shells |
| -50.2 (10.0) | | | | | | | | | |

Tip of penetrometer spoon went 2.0 foot without driving. Set 51 foot of 8" casing to Elevation -40.5; casing pulled out easily. Drilled 10 Nov 70.

# 70-3

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] (0.0) / [illegible]+1' O.D. / C.O.D. | SP | 90 | 88 | 53 | 3 | | NP | 7 | Sand, fine to coarse, gray, with shells. Drilling needed through coarse sand and shells, remainder jetted easily |
| [illegible] (11.7) | SP | 100 | 90 | 83 | 3 | | NP | | Sand, fine, gray |
| [illegible] (17.2) | | | | | | | | | |

Tip of penetrometer spoon went 0.9 foot without driving. Set 51 feet of NX casing to Elevation -44.5; casing pulled out easily. Drilled 11 Nov 70.

70 4 AND 70 5 NOT DRILLED BECAUSE OF PIPE AND CABLE CROSSING AT PROPOSED LOCATION.

# 70-6

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] (0.0) / -40+1 O.D. / C.O.D. | SM | | 100 | 96 | 53 | 37 | | NP | 10 | Sand, fine to coarse, gray with shells. Drilling was needed through coarse sand and shells, remainder jetted easily |
| [illegible] (9.6) | SP-SM | | 100 | 99 | 90 | 7 | | NP | | Sand, fine to medium, gray, shells |
| [illegible] (11.3) | SM | 100 | 95 | 75 | 30 | 12 | | NP | | Silty sand, gray, shells and gravel lens, drilling needed |
| [illegible] (12.7) | SC | 92 | 76 | 75 | 50 | 36 | 70 | 51 | | Sandy clay, gray, drilling needed |
| [illegible] (16.7) | | | | | | | | | | |

Tip of penetrometer spoon went 2.2 feet without driving. Set 51 feet of NX casing to Elevation -44.0; casing pulled out easily. Drilled 10 Nov 70.

# 70-7

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] (0.0) / 40+1 O.D. / C.O.D. | SP | 100 | 90 | 70 | 5 | | NP | 10 | Sand, fine to coarse, with shells, streak of sandy silt |
| [illegible] (5.0) | SP-SM | | 100 | 96 | 8 | | NP | | Sand, fine, gray, micaceous |
| [illegible] (9.6) | SP | | 100 | 96 | 4 | | NP | | Sand, fine, light gray |
| [illegible] (15.3) | | | | | | | | | |

Tip of penetrometer spoon went 3.0 feet without driving. Set 46 feet of NX casing to Elevation -44.5; casing pulled out easily. Drilled 10 Nov 70.

# 70-8

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] (0.0) / C.O.D. / 40+1 O.D. | SP | | 100 | 62 | 3 | | NP | | Sand, fine, light gray |
| [illegible] (4.0) | SP-SM | | 100 | 94 | 8 | | NP | 4 | Silty sand, fine, dark gray, micaceous |
| [illegible] (8.4) | SP-SM | 100 | 90 | 67 | 8 | | NP | | |
| [illegible] (10.8) | SC | | 100 | 82 | 46 | 31 | 10 | | Sandy silt, fine, brown, drilling needed |
| [illegible] (16.1) | | | | | | | | | |

Tip of penetrometer spoon went 3.1 feet without driving. Set 56 feet of NX casing to Elevation -40.3; casing was hard to pull but did not need reverse driving. Drilled 12 Nov 70.

# 70-9

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] (0.0) | SP | 100 | 90 | 67 | 2 | | NP | 19 | Sand, fine to medium, gray, with shells |
| [illegible] (10.0) | | | | | | | | | |

Tip of penetrometer spoon went 2.6 feet without driving. Set 51 feet of NX casing to Elevation -40.5; casing pulled out easily. Drilled 10 Nov 70.

# 70-10

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -30.0 (0.0) / +1' O.D. / C.O.D. | SM | 100 | 98 | 96 | 60 | 18 | | NP | | Sand, medium to fine, with lenses of gravel, loose |
| -34.0 (3.0) | SC | 100 | 99 | 98 | 78 | 42 | 28 | 11 | 3 | Sandy clay, gray, drilling needed |
| -40.0 (9.0) | SP-SM | | | 100 | 97 | 5 | | NP | | Sand, fine, gray brown, micaceous |
| -52.0 (12.0) | SP-SM | | | 100 | 95 | 10 | | NP | 56 | |
| -55.0 (15.0) | | | | | | | | | | |

Tip of penetrometer spoon went 2.7 feet without driving. Set 56 feet of NX casing to Elevation -50; casing was hard to pull but did not need reverse driving. Drilled 4 Nov 70.

# 70-11

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -31.0 (0.0) | SP-SM | 98 | 93 | 60 | 7 | | NP | 11 | Silty sand, dark gray, micaceous, shell fragments, some organic material |
| -38.0 (7.0) / -40+1' O.D. / C.O.D. | CL | 98 | 97 | 90 | 56 | 33 | 18 | | Clay, brown, moderately soft with streaks of fine sand |
| -43.0 (12.0) | | | | | | | | | |

Tip of penetrometer spoon went 2.0 feet without driving. Set 53 feet of NX casing to Elevation -43.0; casing pulled out easily. Drilled 4 Nov 70.

# 70-12

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -32.0 (0.0) / -35+1' O.D. / C.O.D. | SP | 98 | 84 | 21 | 2 | | NP | 15 | Shells, silty fine sand, and fine sand, gray |
| -37.0 (5.0) | SP | 90 | 91 | 28 | 2 | | NP | 31 | |
| -42.1 (9.3) | | | | | | | | | |

Tip of penetrometer spoon went 2.6 feet without driving. Set 46 feet of NX casing to Elevation -42; casing pulled out easily. Drilled 5 Nov 70.

# 70-13

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -32.0 (0.0) / -35+1' O.D. / C.O.D. | SP | 100 | 98 | 90 | 66 | 3 | | NP | 12 | Silty sand, fine, gray, with shells |
| -37.0 (5.3) | SP | | 100 | 90 | 81 | 4 | | NP | | Sand, gray, fine with a few shells |
| -44.0 (10.6) | SP-SM | 100 | 98 | 88 | 90 | 9 | | NP | 90+ | (Casing settled to El -45 when spoon was withdrawn.) |
| -45.7 (12.1) | | | | | | | | | | |

Tip of penetrometer spoon went 1.9 feet without driving. Set 46 feet of NX casing to Elevation -45; casing pulled out easily. Drilled 9 Nov 70.

# 70-14

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -32.2 (0.0) / -35+1' O.D. / C.O.D. | SP | 100 | 87 | 86 | 40 | 2 | | NP | 6 | Shells, sand and silty sand, with a few pebbles |
| -37.2 (5.0) | SP | 100 | 95 | 85 | 33 | 2 | | NP | 53 | |
| -40.8 (8.6) | | | | | | | | | | |

Tip of penetrometer spoon went 2.0 feet without driving. Set 46 feet of NX casing to Elevation -40; casing pulled out easily. Drilled 5 Nov 70.

# 70-15

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -32.4 (0.0) / -36+1' O.D. / C.O.D. | SP | 100 | 98 | 94 | 61 | 4 | | NP | 24 | Sand, fine, gray, with shells |
| -37.4 (5.0) | SP | | | 100 | 84 | 2 | | NP | 50+ | Sand, fine, gray |
| -42.4 (10.0) | | | | | | | | | | |

Tip of penetrometer spoon went 0.0 feet without driving. Set 46 feet of NX casing to Elevation -41; casing pulled out easily. Drilled 5 Nov 70.

# 70-16

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -33.4 (0.0) | SP | 100 | 98 | 93 | 37 | 4 | | NP | 6 | Silty sand, fine, black to gray, some organic material |
| -38.4 (5.0) | SP | 100 | 95 | 66 | 11 | 3 | | NP | | Silty sand, fine to medium, light brown, drilling needed |
| -41.5 (8.0) | | | | | | | | | | |

Tip of penetrometer spoon went 1.7 feet without driving. Set 46 feet of NX casing to Elevation -41; casing pulled out easily. Drilled 3 Nov 70.

# 70-17

| El. (Depth) | | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -32.9 (0.0) / -35+1' O.D. / C.O.D. | SP-SM | 100 | 96 | 90 | 78 | 5 | | NP | 17 | Sand, fine, and silty sand, fine to medium, gray, shells in upper three feet |
| -38.1 (6.2) | SM | | 100 | 99 | 86 | 15 | | NP | | |
| -43.7 (10.8) | SC | | | 100 | 96 | 58 | 28 | 10 | 39 | Sandy clay, fine, brown |
| -45.1 (12.2) | | | | | | | | | | |

Tip of penetrometer spoon went 1.1 foot without driving. Set 46 feet of NX casing to Elevation -42.4; casing was pulled without reverse driving. Drilled 9 Nov 70.

# 70-18

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -34.1 (0.0) / -38+1' O.D. / C.O.D. | SP-SM | 99 | 95 | 82 | 6 | | NP | 21 | Silty sand, fine, micaceous |
| -39.1 (5.0) | | | | | | | | | |

Tip of penetrometer spoon went 2.3 feet without driving. Set 46 feet of NX casing to Elevation -39.1; casing pulled out easily. Drilled 2 Nov 70.

# 70-19

| El. (Depth) | | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -32.5 (0.0) | | | | 100 | 62 | 51 | 26 | | Muck, organic silt, black, micaceous (Sample from outside of tool and 3 ? in spoon) |
| -35.0 (2.5) / -1' O.D. / C.O.D. | SP-SM | | | 100 | 8 | | NP | 22 | Silty sand, blue gray |
| -40.0 (7.5) | | | | | | | | | |

Tip of penetrometer spoon went 2.8 feet without driving. Set 46 feet of NX casing to Elevation -40; casing pulled out easily. Drilled 2 Nov 70.

NOTES: 1970 EXPLORATION

1. ALL HOLES WERE DRILLED FROM AN ANCHORED BARGE. DIRECT JETTING NORMALLY ADVANCED THE HOLE RAPIDLY. ROTATION OF THE DRILL WAS NEEDED AS INDICATED ON THE LOGS.
2. OCEAN WATER WAS PUMPED THROUGH A-RODS (1 1/8 INCH I.D., 1 5/8 INCH O.D.) AND RETURNED THROUGH NX-CASING (3 INCH I.D., 3 1/2 INCH O.D.) TO THE DECK OF THE BARGE.
3. SAMPLES WERE GENERALLY SECURED BY DIRECTING THE RETURN WASH WATER INTO A FOUR COMPARTMENT SETTLING TANK AND SAVING A PORTION OF MATERIAL COLLECTED BY EACH COMPARTMENT DURING ADVANCE FOR EACH SAMPLE INTERVAL. PRACTICALLY NO MATERIAL ESCAPED COLLECTION IN THE LARGER COMPARTMENT.
4. SAMPLES WERE RECOVERED FROM THE SPOON FOR MANY OF THE STANDARD PENETRATION TESTS. TEST RESULTS ON SPOON SAMPLES ARE IDENTIFIED WHERE SHOWN ON THE LOG. TEST RESULTS ON OTHER SPOON SAMPLES ARE AVAILABLE FOR INSPECTION.
5. NX-CASING WAS ADVANCED WHENEVER WALLS OF THE HOLE STARTED TO CAVE.
6. THE FIRST STANDARD PENETRATION TEST WAS MADE AFTER THE BARGE WAS ANCHORED AND CASING WAS LOWERED TO THE BOTTOM OF THE BAY. THE TEST WAS OFFSET ABOUT THREE FEET FROM THE ACTUAL HOLE. DEEPER STANDARD PENETRATION TESTS WERE MADE THROUGH THE CASING.
7. THE REMARKS ARE BASED ON FIELD OBSERVATION DURING DRILLING.
8. THE DISTANCE THE PENETROMETER SPOON WENT WITHOUT DRIVING WAS DETERMINED BY SUBTRACTING THE ELEVATION OF THE SPOON AT REST, BEFORE DRIVING, FROM ELEVATION OF THE BAY BOTTOM DETERMINED BY MEASUREMENT WITH TAPE AND WEIGHT. THE RESULT WOULD INCLUDE EFFECT OF ANY LOCAL UNEVENNESS OF THE BAY FLOOR AS WELL AS THE THICKNESS OF VERY LOOSE MATERIAL OF THE TYPE INDICATED ON THE LOGS.
9. SPECIAL ENVIRONMENTAL CHEMICAL TESTS WERE REQUESTED IN 1971. ENVIRONMENTAL SAMPLING WAS DONE IN JUNE 1971 TO SECURE MATERIAL FOR THE TESTS. SAMPLING FOR ADDITIONAL ENVIRONMENTAL TESTS WAS DONE IN 1971, 1972 AND 1973.

VERT SCALE FEET

| SYMBOL | DESCRIPTIONS | DATE | APPROVAL |
|---|---|---|---|
| | | | |
| | | | |

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J R T
DRAWN BY: L L W
CHECKED BY: B D J

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

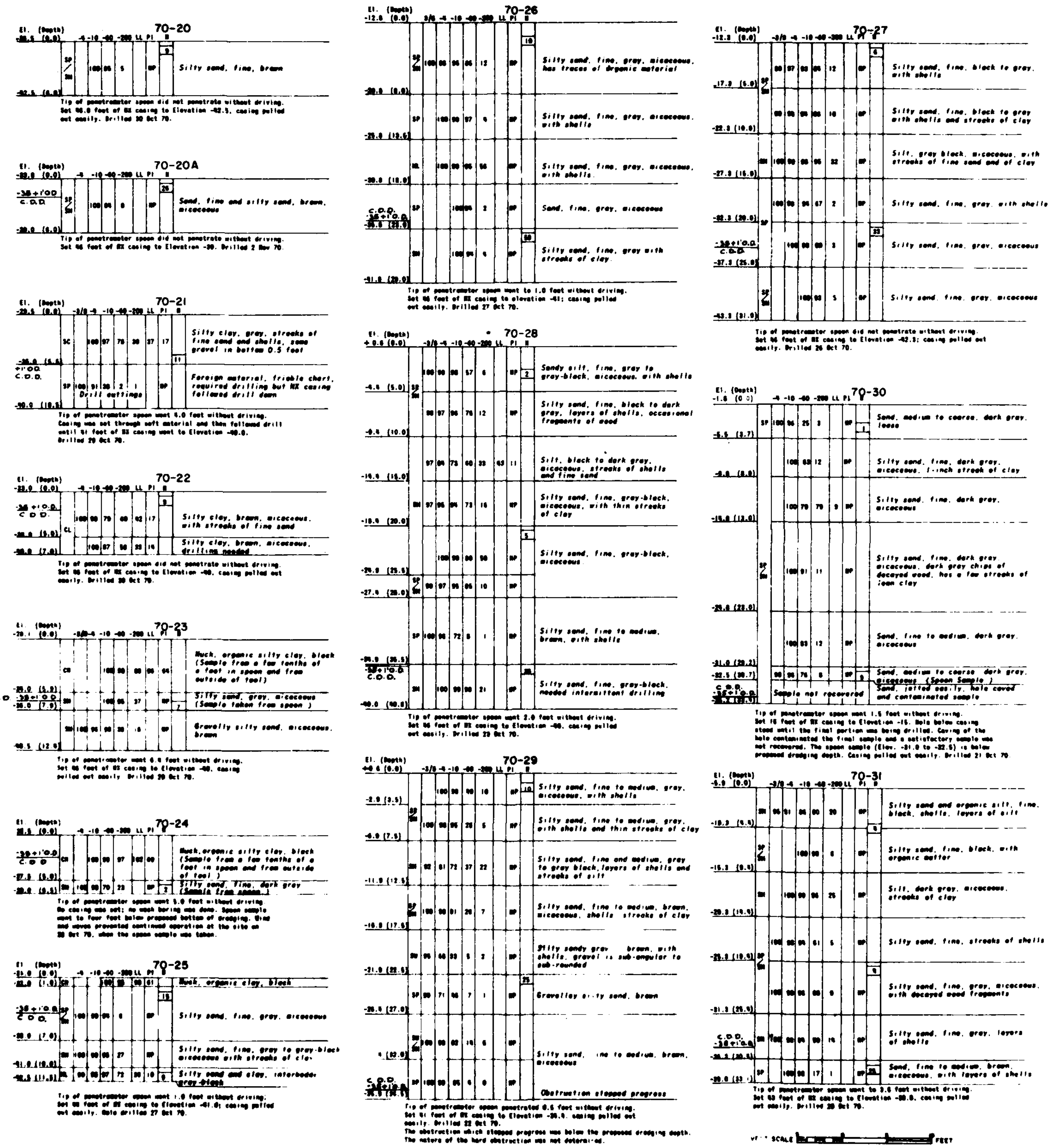
LOGS OF TEST HOLES

SCALE AS SHOWN

SUBMITTED BY: [signature]
CHIEF, FOUNDATIONS AND MATERIALS BRANCH
DATE: AUGUST 1973

SPEC. NO.
DRAWING NUMBER
DISTRICT FILE NO. D-756
SHEET

U.S. ARMY ENGINEER DISTRICT



## 70-27

| El. (Depth) | Symbol | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -12.3 (0.0) to -17.3 (5.0) | SP/SM | 98 | 97 | 93 | 86 | 12 | | NP | 6 | Silty sand, fine, black to gray, with shells |
| -17.3 (5.0) to -22.3 (10.0) | | 98 | 98 | 98 | 88 | 10 | | NP | | Silty sand, fine, black to gray with shells and streaks of clay |
| -22.3 (10.0) to -27.3 (15.0) | SM | 100 | 98 | 98 | 96 | 32 | | NP | | Silt, gray black, micaceous, with streaks of fine sand and of clay |
| -27.3 (15.0) to -32.3 (20.0) | | 100 | 98 | 96 | 67 | 2 | | NP | | Silty sand, fine, gray, with shells |
| -32.3 (20.0) to -37.3 (25.0) | SP | | 100 | 98 | 88 | 3 | | NP | 23 | Silty sand, fine, grav, micaceous |
| -37.3 (25.0) to -43.3 (31.0) | SP/SM | | | 100 | 93 | 5 | | NP | | Silty sand, fine, gray, micaceous |

-35+1' O.D. C.D.D.

Tip of penetrometer spoon did not penetrate without driving. Set 46 feet of NX casing to Elevation -42.3; casing pulled out easily. Drilled 26 Oct 70.

## 70-30

| El. (Depth) | Symbol | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|
| -1.8 (0.0) to -5.5 (3.7) | SP | 100 | 96 | 25 | 3 | | NP | 1 | Sand, medium to coarse, dark gray, loose |
| -5.5 (3.7) to -9.8 (8.0) | | | 100 | 63 | 12 | | NP | | Silty sand, fine, dark gray, micaceous, 1-inch streak of clay |
| -9.8 (8.0) to -15.8 (13.0) | | | 100 | 79 | 78 | 9 | NP | | Silty sand, fine, dark gray, micaceous |
| -15.8 (13.0) to -23.8 (22.0) | SP/SM | | 100 | 91 | 11 | | NP | | Silty sand, fine, dark gray, micaceous, dark gray chips of decayed wood, has a few streaks of lean clay |
| -23.8 (22.0) to -31.0 (29.2) | | | 100 | 83 | 12 | | NP | | Sand, fine to medium, dark gray, micaceous |
| -31.0 (29.2) to -32.5 (30.7) | | 99 | 96 | 76 | 8 | | NP | 9 | Sand, medium to coarse, dark gray, micaceous (Spoon Sample) |
| -32.5 (30.7) to -35.3 (33.5) | | Sample not recovered | | | | | | | Sand, jetted easily, hole caved and contaminated sample |

C.D.D. -35+1' O.D.

Tip of penetrometer spoon went 1.5 feet without driving. Set 16 feet of NX casing to Elevation -15. Hole below casing stood until the final portion was being drilled. Caving of the hole contaminated the final sample and a satisfactory sample was not recovered. The spoon sample (Elev. -31.0 to -32.5) is below proposed dredging depth. Casing pulled out easily. Drilled 21 Oct 70.

## 70-31

| El. (Depth) | Symbol | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| -5.3 (0.0) to -10.3 (5.0) | SM | 95 | 91 | 86 | 80 | 20 | | NP | | Silty sand and organic silt, fine, black, shells, layers of silt |
| -10.3 (5.0) to -15.3 (10.0) | SP/SM | | | 100 | 98 | 6 | | NP | 9 | Silty sand, fine, black, with organic matter |
| -15.3 (10.0) to -20.3 (15.0) | SM | | 100 | 98 | 98 | 25 | | NP | | Silt, dark gray, micaceous, streaks of clay |
| -20.3 (15.0) to -25.3 (20.0) | | 100 | 98 | 94 | 61 | 5 | | NP | | Silty sand, fine, streaks of shells |
| -25.3 (20.0) to -31.3 (26.0) | SP/SM | 100 | 98 | 96 | 88 | 9 | | NP | 9 | Silty sand, fine, gray, micaceous, with decayed wood fragments |
| -31.3 (26.0) to -36.3 (30.0) | SM | 100 | 98 | 94 | 50 | 10 | | NP | | Silty sand, fine, gray, layers of shells |
| -36.3 (30.0) to -39.0 (33.7) | SP | | 100 | 98 | 17 | 1 | | NP | 23 | Sand, fine to medium, brown, micaceous, with layers of shells |

C.D.D. -35+1' O.D.

Tip of penetrometer spoon went to 1.6 feet without driving. Set 43 feet of NX casing to Elevation -38.0, casing pulled out easily. Drilled 20 Oct 70.

SCALE FEET

## 70-32

| El. (Depth) | Symbol | -3/8 | -4 | -10 | -40 | -200 | LL | PI | N | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 (0.0) to -4.0 | SM | 90 | 82 | 78 | 56 | 17 | | NP | 9 | Sand, coarse to fine, gray, with many shells |
| -4.0 to -6.3 | SC | | | 100 | 87 | 49 | 30 | 14 | | Sandy clay, brown, drilling needed |
| -6.3 to -11.0 | SM | | 100 | 90 | 73 | 22 | | NP | | Silty sand, fine, brown, micaceous |
| -11.0 to -16.0 | SP/SM | | | 100 | 62 | 8 | | NP | | |
| -16.0 to -19.0 | SM | | | 100 | 77 | 22 | | NP | | |
| -19.0 to -22.3 | SP | 100 | 86 | 74 | 16 | 3 | | NP | | Sand, coarse, gray, clean |
| -22.3 to -28.5 | CH | | 100 | 98 | 93 | 90 | 55 | 27 | | Sandy clay, brown, drilling needed |
| -28.5 to -38.0 | SP/SM | | | 100 | 86 | 7 | | NP | 61 | Sand and silty sand, fine, gray-brown, micaceous |
| -38.0 to -40.2 | SM | | | 100 | 98 | 13 | | NP | | |

C.D.D. -35+1' O.D.

Tip of penetrometer spoon went 1.6 feet without driving. Set 38 feet of NX casing to Elevation -30. Reverse driving was needed to remove casing. Drilled 6 Nov 70.

NOTES:

1. ALL HOLES WERE DRILLED FROM AN ANCHORED BARGE. DIRECT JETTING NORMALLY ADVANCED THE HOLE RAPIDLY. ROTATION OF THE DRILL WAS NEEDED AS INDICATED ON THE LOGS.
2. OCEAN WATER WAS PUMPED THROUGH A-RODS (1 1/8 INCH I.D., 1 5/8 INCH O.D.) AND RETURNED THROUGH NX-CASING (3 INCH I.D., 3 1/2 INCH O.D.) TO THE DECK OF THE BARGE.
3. SAMPLES WERE GENERALLY SECURED BY DIRECTING THE RETURN WASH WATER INTO A FOUR COMPARTMENT SETTLING TANK AND SAVING A PORTION OF MATERIAL COLLECTED BY EACH COMPARTMENT DURING ADVANCE FOR EACH SAMPLE INTERVAL. PRACTICALLY NO MATERIAL ESCAPED COLLECTION IN THE LARGER COMPARTMENT.
4. SAMPLES WERE RECOVERED FROM THE SPOON FOR MANY OF THE STANDARD PENETRATION TESTS. TEST RESULTS ON SPOON SAMPLES ARE IDENTIFIED WHERE SHOWN ON THE LOG. TEST RESULTS ON OTHER SPOON SAMPLES ARE AVAILABLE FOR INSPECTION.
5. NX-CASING WAS ADVANCED WHENEVER WALLS OF THE HOLE STARTED TO CAVE.
6. THE FIRST STANDARD PENETRATION TEST WAS MADE AFTER THE BARGE WAS ANCHORED AND CASING WAS LOWERED TO THE BOTTOM OF THE BAY. THE TEST WAS OFFSET ABOUT THREE FEET FROM THE ACTUAL HOLE. DEEPER STANDARD PENETRATION TESTS WERE MADE THROUGH THE CASING.
7. THE REMARKS ARE BASED ON FIELD OBSERVATION DURING DRILLING.
8. THE DISTANCE THE PENETROMETER SPOON WENT WITHOUT DRIVING WAS DETERMINED BY SUBTRACTING THE ELEVATION OF THE SPOON AT REST, BEFORE DRIVING, FROM ELEVATION OF THE BAY BOTTOM DETERMINED BY MEASUREMENT WITH TAPE AND WEIGHT. THE RESULT WOULD INCLUDE EFFECT OF ANY LOCAL UNEVENNESS OF THE BAY FLOOR AS WELL AS THE THICKNESS OF VERY LOOSE MATERIAL OF THE TYPE INDICATED ON THE LOGS. DIVER OBSERVATIONS IN 1972 OF THE BOTTOM NEAR HARBOR HOLE 11 ARE INCLUDED ON PLATES I-5 AND I-6.
9. RESULTS OF TESTS ON ENVIRONMENTAL SAMPLES ARE GIVEN IN REPORT I-1 AND TABLE I-4.
10. SAMPLES OF DECEMBER 1971 WERE TAKEN FROM AN ANCHORED BOAT. A LOUDEN EXPERIMENTAL SAMPLER WAS USED FOR E1-C, E6-C, E8-C AND E17-C. AN ORANGE PEEL SAMPLER WAS USED FOR THE REMAINDER.

## UNIFIED SOIL CLASSIFICATION SYSTEM

| MAJOR DIVISIONS | | | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE GRAINED SOILS More than half of material is larger than no. 200 sieve size. | GRAVELS More than half of coarse fraction is larger than no. 4 sieve size. | Clean gravels | GW | Well-graded gravels, gravel-sand mixtures, little or no fines. |
| | | | GP | Poorly-graded gravels, gravel-sand mixtures, little or no fines. |
| | | Gravels with fines | GM | Silty gravels, gravel-sand-silt mixtures. |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures. |
| | SANDS More than half of coarse fraction is smaller than no. 4 sieve size. | Clean sands | SW | Well-graded sands, gravelly sands, little or no fines. |
| | | | SP | Poorly-graded sands, gravelly sands, little or no fines. |
| | | Sands with fines | SM | Silty sands, sand-silt mixtures. |
| | | | SC | Clayey sands, sand-clay mixtures. |
| FINE GRAINED SOILS More than half of material is smaller than no. 200 sieve size. | SILTS AND CLAYS | Low liquid limit. | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity. |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | | OL | Organic silts and organic silty clays of low plasticity. |
| | | High liquid limit. | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. |
| | | | CH | Inorganic clays of high plasticity, fat clays. |
| | | | OH | Organic clays of medium to high plasticity, organic silts. |
| Highly organic soils | | | Pt | Peat and other highly organic soils. |

NOTES:

1. Boundary Classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.
2. All sieve sizes on this chart are U. S. Standard.
3. The terms "silt" and "clay" are used respectively to distinguish materials exhibiting lower plasticity from those with higher plasticity. The minus no. 200 sieve material is silt if the liquid limit and plasticity index plot below the "A" line on the plasticity chart (Table VI, Military Standard 619A), and is clay if the liquid limit and plasticity index plot above the "A" line on the chart.
4. For a complete description of the Unified Soil Classification System, see "Military Standard 619A" dated 20 March 1962.

## LEGEND

| | |
|---|---|
| 70-24 ● | LOCATION AND NUMBER OF TEST HOLE, DRILLED IN 1970 |
| -28.0 | ELEVATION BELOW MEAN LOWER LOW WATER, DETERMINED FROM TIDE TABLE AND MEASUREMENTS |
| LL | LIQUID LIMIT. |
| PI | PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT). |
| NP | NONPLASTIC |
| -4 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE |
| -200 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SIEVE |
| .005 | PERCENT OF MATERIAL FINER THAN .005 MILLIMETERS |
| N | NUMBER OF BLOWS OF A 140-POUND DROPHAMMER FALLING 30 INCHES REQUIRED TO DRIVE A SAMPLING SPOON ONE FOOT. OUTSIDE DIAMETER OF SPOON IS 2 INCHES; INSIDE DIAMETER IS 1-3/8 INCHES. PROCEDURE IS CALLED STANDARD PENETRATION TEST. |

### ENVIRONMENTAL SAMPLES-DEC. 1971
### ALL HOLES LESS THAN 1 FOOT DEEP

| HOLE NO. ELEV. | Symbol | -3/8 | -4 | -10 | -40 | -200 | .005 | .001 | Description |
|---|---|---|---|---|---|---|---|---|---|
| E1-C -44.1 | SP | | | 100 | 70 | 9 | 0 | | SAND, BROWN, SAT. FREE WATER, CLEAN MICACEOUS. |
| E2-C -50.0 | SM | | | 100 | 80 | 10 | 7 | 3 | SILTY SAND, DARK GRAY, SAT. MODERATE AMOUNT OF SHELL FRAG. |
| E3-C -50.4 | CL | | 100 | 81 | 75 | 46 | 29 | 13 | SANDY CLAY, DARK GRAY, SAT. MODERATE AMOUNT OF SHELL FRAG. |
| E4-C -40.1 | SC | | 100 | 99 | 90 | 40 | 7 | 3 | CLAYEY SAND, DARK GRAY, SAT. FREE WATER MICACEOUS, SHELL FRAG. |
| E5-C -40.0 | CL | | 100 | 99 | 75 | 37 | 20 | 13 | SANDY CLAY, DARK GRAY, SAT. FREE WATER MANY SHELL FRAG. ODOROUS. |
| E6-C -34.0 | | | 100 | 82 | 19 | 6 | | 2 | MANY SEA SHELLS WITH SMALL AMOUNT OF SILTY SAND SOIL. FREE WATER, ODOROUS. |
| E7-C -45.7 | SC | | 100 | 99 | 75 | 33 | 18 | 11 | CLAYEY SAND, DARK GRAY, SAT. FREE WATER MANY SEA SHELLS. |
| E8-C -32.5 | | 88 | 82 | 80 | 37 | 13 | 6 | 3 | MAINLY SEA SHELLS WITH SMALL AMOUNT SILTY SAND SHELLS. FREE WATER, ODOROUS. |
| E9-C -37.5 | CL | | | 100 | 92 | 86 | 18 | 11 | SANDY CLAY, DARK GRAY, SAT. FREE WATER, SEA SHELLS, ODOROUS. |
| E10-C -30.4 | CL | | | | 100 | 40 | 18 | 13 | SANDY CLAY, DARK GRAY, SAT. FREE WATER, SEA SHELLS, ODOROUS. |
| E11-C -33.9 | CL | | | 100 | 98 | 60 | 18 | 6 | SANDY CLAY, DARK GRAY, SAT. FREE WATER, MICACEOUS. |
| E12-C -32.6 | CL | | | 100 | 98 | 83 | 40 | 18 | SANDY CLAY, DARK GRAY, SAT. FREE WATER SEA SHELLS, ODOROUS. |
| E13-C -37.0 | CL | | | 100 | 92 | 43 | 22 | 13 | SANDY CLAY, DARK GRAY, SAT. FREE WATER, SEA SHELLS, ODOROUS. |
| E14-C -29.0 | SC | | | 100 | 90 | 45 | 18 | 10 | CLAYEY SAND, DARK GRAY, SAT. FREE WATER MICACEOUS. |
| E15-C -40.8 | CL | | | 100 | 97 | 96 | 18 | 11 | CLAY, GRAY, SAT. FREE WATER, TRACE OF FINE SAND. |
| E16-C -10.6 | CL | | | | 100 | 98 | 57 | 30 | CLAY, GRAY, SAT. FREE WATER, TRACE OF FINE SAND. |
| E17-C -2.0 | SM | | | 100 | 95 | 15 | 5 | 3 | SILTY SAND, DARK GRAY, SAT. MICACEOUS ODOROUS. |
| E18-C +1.0 | SM | | | 100 | 98 | 45 | 10 | 6 | SILTY SAND, DARK GRAY, SAT. FREE WATER, MICACEOUS. |

| SYMBOL | DESCRIPTIONS | DATE | APPROVAL |
|---|---|---|---|

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J R T

DRAWN BY: L L W

CHECKED BY: B D J

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

# LOGS OF TEST HOLES

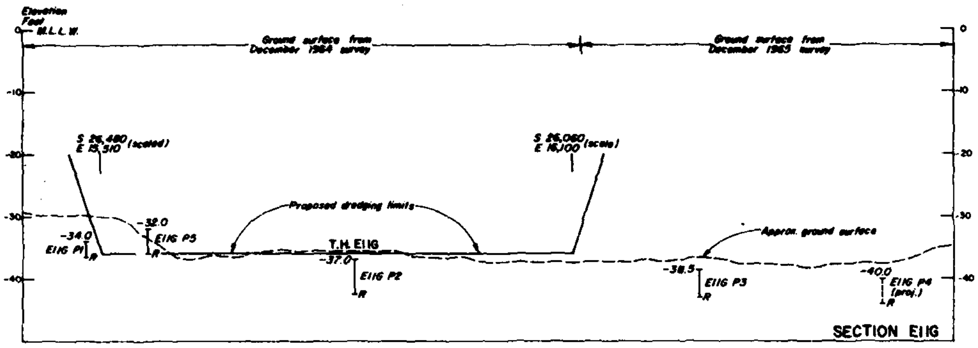
SUBMITTED BY: John M. Bird
CHIEF, FOUNDATIONS AND MATERIALS BRANCH
DATE: AUGUST 1973

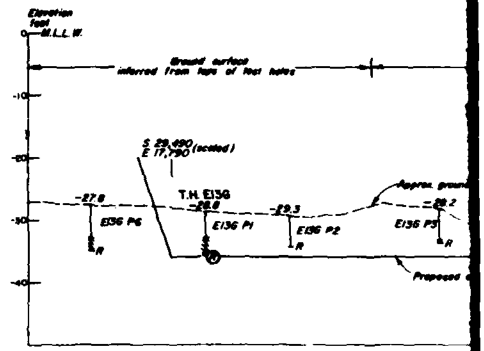
SPEC. NO
DRAWING NUMBER
DISTRICT FILE NO. D-757
SHEET

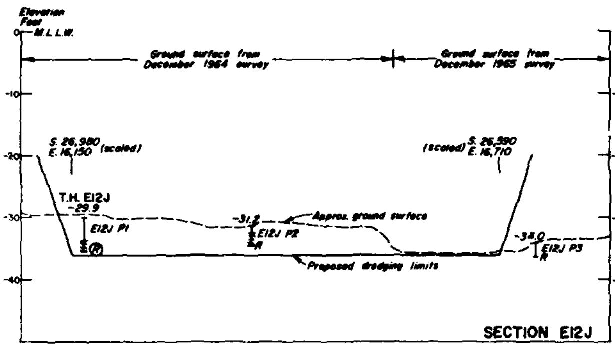
D. O. SERIES

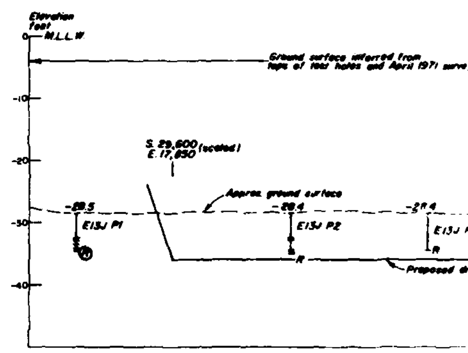
2

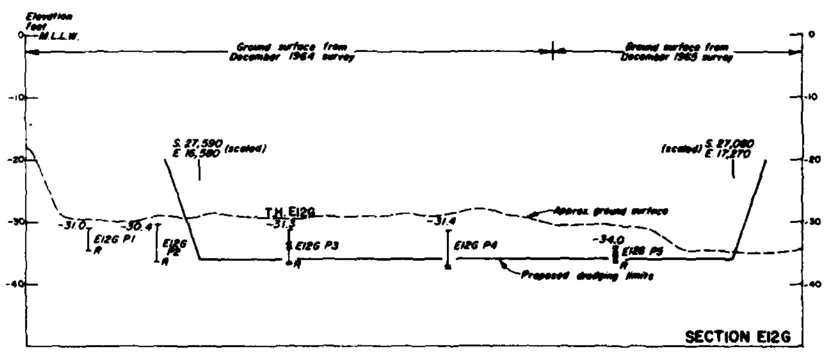
U.S. ARMY ENGINEER DISTRICT

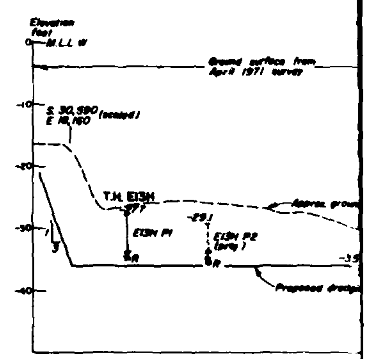


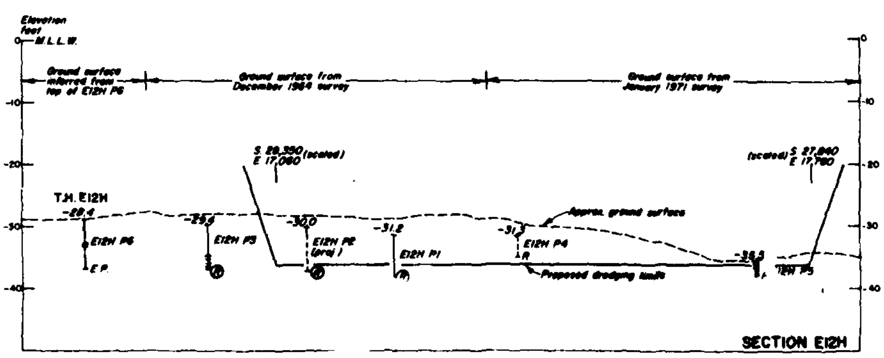



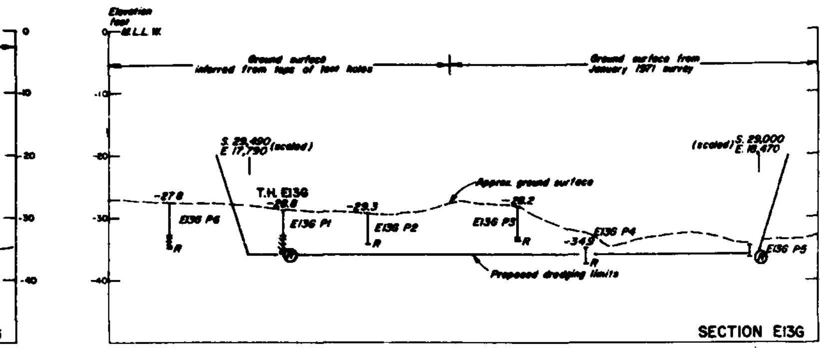



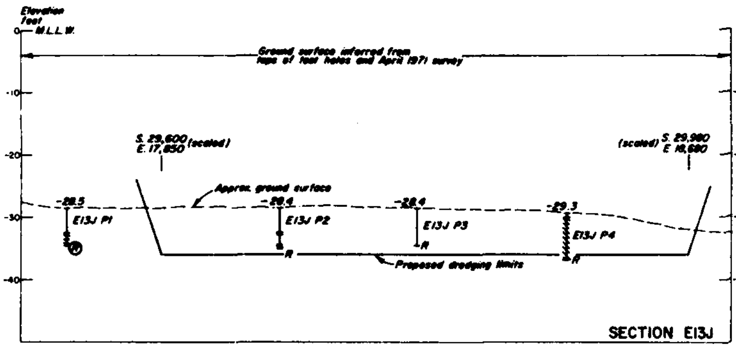

NOTES:

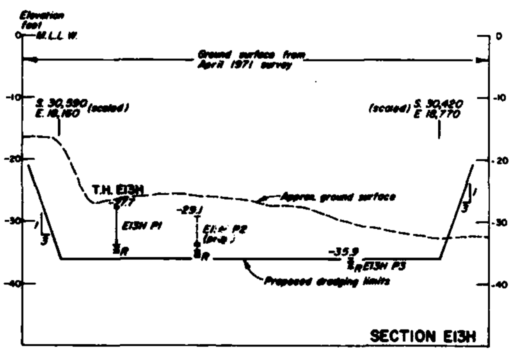
1. A hard hat diver made all probes and holes by us
2. Continuous voice communication was available betwee and the diver on the bottom.
3. Each probe description is based on diver's comment a 5/8" metal rod at several points within the rad probe location; inspection of occasional informa with a 2 1/2" ID plastic tube 3' long whenever req of samples recovered at holes for environmental te
4. A probe with substantial penetration was selected as the location for a formal hole to sample for th of environmental qualities. Test results are given
5. The Unified Soils Classification is described on P tests were made on several of the samples recove with distribution of particle sizes smaller than t made of samples for environmental testing

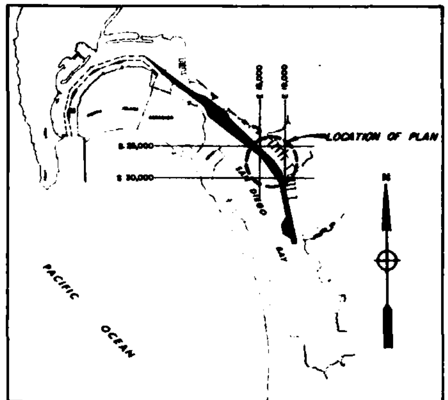
HORIZONTAL SCALE 100 0 100 200 300 FEET

CORPS OF ENGINEERS



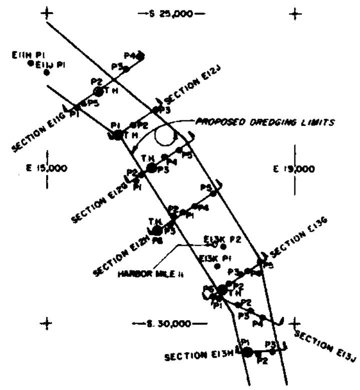




VICINITY MAP

SCALE 8000 0 8000 FEET




PLAN

SCALE 1000 0 1000 2000 FEET

LEGEND

- E11G — SECTION INVESTIGATED
- P — LOCATION OF TEST PROBE
- T H — LOCATION OF TEST HOLE
- -27.7 — ELEVATION AT TOP OF TEST HOLE OR PROBE, DETERMINED FROM TIDE TABLES AND MANOMETER MEASUREMENTS.
- SANDY INTERVAL
- VERY STIFF CLAY INTERVAL
- R — DEPTH OF PROBE REFUSAL
- Ⓡ — ABRUPT OR DEFINITE REFUSAL
- E.P — END OF PROBE, REFUSAL NOT ENCOUNTERED
- S. 30,590 E. 18,160 — COORDINATES, CORPS OF ENGINEERS LOCAL GRID SYSTEM.(SCALED FROM C.&G.S. CHART 5105)
- TEST HOLE OR PROBE
- PROJECTED TEST HOLE OR PROBE

NOTES:

1. A hard hat diver made all probes and holes by using hand operated equipment.
2. Continous voice communication was available between the geologist on board and the diver on the bottom.
3. Each probe description is based on diver's comments while penetrating with a 5/16" metal rod at several points within the radius of visibility at the probe location; inspection of occasional informal samples the diver secured with a 2 1/2" ID plastic tube 3' long whenever requested, and consideration of samples recovered at holes for environmental test samples.
4. A probe with substantial penetration was selected in each of six sections as the location for a formal hole to sample for the maximum series of tests of environmental qualities. Test results are given in Report I-4.
5. The Unified Soils Classification is described on PLATE I-3. Classification tests were made on several of the samples recovered for inspection. Tests with distribution of particle sizes smaller than the No. 200 sieve were made of samples for environmental testing.

| SYMBOL | DESCRIPTIONS | DATE | APPROVAL |
|---|---|---|---|
| | | | |
| | | | |

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.W.L.
DRAWN BY: B.C.M.
CHECKED BY: J.R.T.

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

DETAILED INVESTIGATION MILE 10.2 TO 11.6
PLAN AND SECTIONS

SUBMITTED BY: John A. Bird
CHIEF, FOUNDATION AND MATERIALS BRANCH
DATE: AUGUST 1973

SPEC. NO.
DRAWING NUMBER
DISTRICT FILE NO. D-790
SHEET

2

PLATE I-4

### E11GP1

El. Depth (0.0) – (2.5)

NO SAMPLE

CLAY: one thin shell and clay layer at 1.0' otherwise homogeneous, easily probed.

Refusal

Refusal depth varies from 2" to 3'.

### HOLE E11G

El. Depth -27.0 (0.0) – (3.7)

-4 -10 -40 -200 -60 -400

100 | 86 | 86 | 71 | 15

CLAY: gray-black, homogeneous, very soft to soft, strong sulfide odor. Seven basic E.P.A. tests show: Volatile solids 7.7%, C.O.D. 7.4%, Kjeldahl nitrogen 0.21%, Oil and grease 0.4%, Hg 2.6 p.p.m., Pb 230 p.p.m., and Zn 160 p.p.m. Results of the maximum series of tests are given in Report 1-4.

SAND: light brown, very fine to fine grained, dense, odorless.

Probe E11GP2 selected as location for Hole E11G.

### E11GP2

El. (Depth) (0.0) – (5.3)

NO SAMPLE

CLAY: homogeneous, very soft to soft, easily probed.

Refusal.

### E11GP4

El. Depth (0.0) – (5.0)

NO SAMPLE

CLAY: gray-black, 0 to 2.0', gray-black to brown 2.0' to 2.5', small amounts of shell evenly distributed, very soft to medium consistency, easily probed, sulfide odor 0' to 2'.

Refusal

Diver's hand penetrates sediment to armpit with moderate effort.

### E11GP3

El. Depth (0.0) – (5.5)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed.

Refusal.

One small amvil shrimp found in upper 2'.

### E11GP5

El. Depth -32.0 (0.0) – (5.0)

NO SAMPLE

CLAY: gray-black, stratified (homogeneous very soft clay from 0.0 to 0.3', soft clay and abundant large shell fragments up to 1" from 0.3' to 2.0', sand layer from 2.0' to 2.3' and homogeneous clay from 2.3' to 4.0'), easily probed with only moderate resistance in sand layer, odorless.

Refusal, in very dense sandy clay.

Refusal depth varies from 3.8' to 5.5'. Sand layer at 2.0' not detected in all probes.

### E11HP1

El. Depth (0.0), (1.0), (2.0), (4.0), (6.0)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, odorless.

SAND; SHELLS, AND CLAY: gray-black, proportion of fine sand and shells increases with depth (50% at 1.8' to 2.0') very dense 1.5 to 2.0' and resistant to probing, sulfide odor 1.2' to 1.5'.

CLAY: homogeneous, easily probed.

SAND AND CLAY: stratified in thin layers, slight probe resistance.

Refusal, definite, very hard surface.

Sand visible on bottom in spots: Live clam found in situ and shrimp seen entering hole.

### E11JP1

El. Depth (0.0), (1.5), (5.5), (6.0)

-4 -10 -40 -200 LL PI

100 | 86 | 60 | 60 | 22

0.0 to 1.3' CLAY: gray-black, very fine sand throughout, very soft to medium consistency, little sulfide odor; 1.3 to 1.5' sandy clay, 40% fine sand and coarse shells. Easily probed.

NO SAMPLE

CLAY, SAND, and SHELLS: easily probed.

CLAY?: very stiff, great difficulty probing.

Refusal, not absolute, very stiff clay?

Live shrimp found in sample. Forty lbs. pull necessary to retrieve metal probe from clay at 5.5'.

### E12GP1

El. Depth -31.0 (0.0) – (5.7)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, moderate sulfide odor.

Refusal.

Diver's shoes sink 2" to 3" into the bottom.

### E12GP2

El. Depth (0.0) – (6.0)

NO SAMPLE

CLAY: gray-black, three 2" to 3" thick, medium grained sand and or shell layers at 2.8', 4.0', and 5.7' otherwise homogeneous very soft to moderately firm clay, easily probed with slight resistance in sand-shell layers, sulfide odor increases with depth 0' to 3'.

Refusal.

### HOLE E12G

El. Depth -31.3 (0.0), (2.0), (3.0)

-4 -10 -40 -200 -60 -400

100 | 86 | 79 | 60 | 12

100 | 96 | 50 | 30 | 22 | 15

Probe E12G P5

CLAY: gray-black, homogeneous, very soft to medium consistency, slight sulfide odor Seven basic E.P.A. tests show; Volatile solids 7.3%, C.O.D. 6.9%, Kjeldahl nitrogen 0.16%, Oil and grease 0.32%, Hg 2.2 p.p.m., Pb 59 p.p.m., and Zn 117 p.p.m.

SAND, SHELLS, AND CLAY: gray-black, unstratified, dense, odorless. Results of all tests of the minimum series were lower than E.P.A. limits of 1971.

### E12GP3

El. Depth -31.0 (0.0), (2.5), (2.7), (5.0), (5.5)

NO SAMPLE

CLAY: homogeneous, very soft to medium consistency, easily probed.

SAND: resistant to probing.

CLAY: easier probing.

SAND/GRAVEL?; dense, difficult probing.

Refusal.

Refusal depth varies from 5' to 6'. Thickness and elevation of upper sand layer highly variable.

### E12GP4

El. Depth (0.0), (5.5), (6.0)

NO SAMPLE

CLAY: gray-black, to grey, one 3" thick dense sand layer at 4' otherwise homogeneous with small amounts of shell throughout, easily probed except for resistant sand layer, slight sulfide odor.

CLAY: very stiff, difficult to retrieve probe.

Refusal, not absolute.

Refusal depth varies from 4' to 6' as does existence of sand layer at 4'. Sea plumes growing on bottom.

### E12GP5

El. Depth (0.0), (1.5), (2.5)

NO SAMPLE

SHELLS AND CLAY: gray-black, shells increase in size and abundance with depth, easy to difficult to probe. odorless.

CLAY, SAND? AND SHELLS?: very stiff clay, difficult to retrieve probe.

Refusal, not absolute, in very stiff clay?.

Some sea plumes living on bott--.

### E12HP1

El. Depth -31.2 (0.0) – (6.5)

NO SAMPLE

CLAY: gray-black, one 2" thick sand-shell layer at 1.2' otherwise homogeneous, very soft to moderately stiff clay, easily probed, moderate sulfide odor 0' to 2'

Refusal, definite, very hard.

One probe hit firm sandy clay layer at 5'. Refusals varied from 6' to 7'.

### E12HP2

El. Depth (0.0) – (7.0)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, strong sulfide odor 0' to 2'.

Refusal, definite, very hard surface.

Refusal depth varies from 5.5' to 7'. Surface clay seems very warm to diver.

### E12HP3

El. Depth (0.0), (5.0), (7.2)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, increasing sulfide odor from 0 to 2'.

SAND, SHELL, AND CLAY: stratified in 2" to 3" layers, slight probe resistance.

Refusal, very hard surface.

### E12HP4

El. Depth -31.3 (0.0) – (3.5)

NO SAMPLE

CLAY: no sand or shell strata detected by probe, easily probed.

Refusal, in sand?.

VERT. SCALE 1 0 2 4 FEET

### E12GP4

El. Depth
-31.6 (0.0)

NO SAMPLE

CLAY: gray-black, to grey, one 3" thick dense sand layer at 4' otherwise homogeneous with small amounts of shell throughout, easily probed except for resistant sand layer, slight sulfide odor.

[illegible] (5.5)
-37.5 (6.0)

CLAY: very stiff, difficult to retrieve probe.

Refusal, not absolute.

Refusal depth varies from 4' to 6' as does existence of sand layer at 4'. See plumes growing on bottom.

### E12GP5

El. Depth
[illegible] (0.0)

NO SAMPLE

SHELLS AND CLAY: grey-black, shells increase in size and abundance with depth, easy to difficult to probe, odorless.

[illegible] (1.5)

CLAY, SAND? AND SHELLS?: very stiff clay, difficult to retrieve probe.

[illegible] (2.5)

Refusal, not absolute, in very stiff clay?.

Same see plumes living on bottom.

### E12HP1

El. Depth
-31.2 (0.0)

NO SAMPLE

CLAY: grey-black, one 2" thick sand-shell layer at 1.2' otherwise homogeneous, very soft to moderately stiff clay, easily probed, moderate sulfide odor 0' to 2'.

-37.7 (6.5)

Refusal, definite, very hard.

One probe hit firm sandy clay layer at 5'. Refusals varied from 6' to 7'.

### E12HP2

El. Depth
[illegible] (0.0)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, strong sulfide odor 0' to 2'.

-37.0 (7.0)

Refusal, definite, very hard surface.

Refusal depth varies from 5.5' to 7'. Surface clay seems very warm to diver.

### E12HP3

El. Depth
[illegible] (0.0)

NO SAMPLE

CLAY: grey-black, homogeneous, very soft to medium consistency, easily probed, increasing sulfide odor from 0 to 2'.

[illegible] (5.0)

SAND, SHELL, AND CLAY: stratified in 2" to 3" layers, slight probe resistance.

[illegible] (7.2)

Refusal, very hard surface.

### E12HP4

El. Depth
-31.2 (0.0)

NO SAMPLE

CLAY: no sand or shell strata detected by probe, easily probed.

[illegible] (3.5)

Refusal, in sand?.

VERT SCALE 0 2 4 6 FEET

### E12HP5

El. Depth
[illegible] (0.0)

NO SAMPLE

SHELLS AND CLAY: shell amount increases with depth, slight probe resistance.

[illegible] (0.8)

CLAY: stiff, very resistant to probing.

-37.6 (2.1)

Refusal, not absolute.

Forty or fifty lbs. pull necessary to retrieve probe from clay below 0.8'.

### HOLE E12H

El Depth
[illegible] (0.0)

| -4 | -10 | -40 | -200 | [illegible] | -.005 |
|---|---|---|---|---|---|
| 100 | 97 | 92 | 80 | 90 | 13 |

0 to 4.0 CLAY; grey-black, thin layer sand and shells in top foot, otherwise homogeneous, very soft to medium consistency slight sulfide odor. 0.0 to 4.5 sample for environmental and particle size tests. Seven basic E.P.A. Tests show; Volatile solids 6.4%, C.O.D. 5.5%, Kjeldahl nitrogen 0.14%, Oil and grease 0.27%, Hg 1.2 p.p.m., Pb 50 p.p.m., and Zn 104 p.p.m.
4.0 to 4.5 SAND, SHELLS, AND CLAY, grey-black, fine grained sand and coarse shell fragments.

[illegible] (4.0)
[illegible] (4.5)

Probe E12H P6 selected as location for Hole E12H.

### E12HP6

El. Depth
[illegible] (0.0)

NO SAMPLE

CLAY: homogeneous, very soft to medium consistency, easily probed.

[illegible] (4.0)
-32.9 (4.5)

SAND: moderate probe resistance.

CLAY: easily probed.

[illegible] (6.0)

End of probe, no refusal encountered.

Thickness of sand layer at 4' variable but penetrable with probe.

### HOLE E12J

El. Depth
[illegible] (0.0)

| -4 | -10 | -40 | -200 | [illegible] | -.005 |
|---|---|---|---|---|---|
| 100 | 88 | 75 | 65 | 46 | 20 |

0.0' to 3.5' CLAY: grey-black, thin sand-shell layer otherwise homogeneous, very soft to medium consistency, sulfide odor from 1.0' to 2.2'.
3.5' to 5.2' SAND, SHELLS, AND CLAY: grey-black to tan, stratified, very fine to medium grained sand, fine to coarse shells, very dense from 4.4' to 5.2'. Zn was 65 p.p.m. Results of the other six minimum series tests were lower than E.P.A. limits of 1971.

[illegible] (5.2)

Refusal, medium brown silty sand.

Probe E12J P1 selected as location for Hole E12J.
Top 1' washed out end of sampler.

### E12JP1

El. Depth
[illegible] (0.0)

| | -4 | -10 | -40 | -200 | LL | PI |
|---|---|---|---|---|---|---|
| CH | 100 | 98 | 92 | 78 | 90 | [illegible] |

CLAY: grey-black, one small sand-shell layer otherwise homogeneous, very soft to medium consistency, easily probed, sulfide odor 1.0 to 2.2'.

[illegible] (2.5)

NO SAMPLE

SAND AND CLAY: stratified, slight to strong probe resistance in sandy intervals.

[illegible] (5.0)

Refusal, very definite in dense sand.

With moderate effort diver's hand penetrates sediment to elbow

### E12JP2

El. Depth
-31.2 (0.0)

-4 -10 -40 -200 LL PI

NO SAMPLE

[illegible] (1.5)

| | -4 | -10 | -40 | -200 | LL | PI |
|---|---|---|---|---|---|---|
| SM | 100 | 98 | 88 | 30 | | NP |

[illegible] (2.0)

NO SAMPLE

[illegible] (2.7)

NO SAMPLE

-34.7 (3.5)

SHELL, SAND, AND CLAY: gray-black increasing amounts of fine and very fine sand and shells, and increased probe resistance with increasing depth, odorless.

SANDY CLAY: stiff to very stiff, very difficult probing.

Refusal, not absolute.

Refusal depths vary from 3.1' to 3.8'.

### E12JP3

El. Depth
[illegible] (0.0)

NO SAMPLE

SAND, SHELL, AND CLAY: grey-black, unstratified, 50% to 75% medium sand and medium to coarse shell fragments, difficult probing, odorless

[illegible] (2.1)

Refusal, not absolute.

## LEGEND

| | |
|---|---|
| E11GP1 | IDENTIFICATION OF TEST PROBE |
| -37.0 | ELEVATION BELOW MEAN LOWER LOW WATER. DETERMINED FROM TIDE TABLES AND MANOMETER MEASUREMENTS. |
| -4 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE. |
| -200 | PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SEIVE. |
| -.005 | PERCENT OF MATERIAL SMALLER THAN .005mm |
| LL | LIQUID LIMIT |
| PI | PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT). |
| CH | FAT CLAY (SHOWN ONLY FOR CLASSIFICATION TEST SAMPLES). |
| SM | SANDY SILT (SHOWN ONLY FOR CLASSIFICATION TEST SAMPLES). |
| NP | NONPLASTIC |

NOTES:

1. A hard hat diver made all probes and holes by using hand operated equipment.
2. Continuous voice communication was available between the geologist on board and the diver on the bottom.
3. Each probe description is based on diver's comments while penetrating with a 5/16" metal rod at several points within the radius of visibility at the probe location; inspection of occasional informal samples the diver secured with a 2 1/2" I.D. plastic tube 3' long whenever requested, and consideration of samples recovered at holes for environmental test samples.
4. A probe with substantial penetration was selected in each of six sections as the location for a formal hole to sample for the maximum series of tests of environmental qualities. Test results are given in Report I-4.
5. The Unified Soils Classification is described on PLATE I-3. Classification tests were made on several of the samples recovered for inspection. Tests with distribution of particle sizes smaller than the No. 200 sieve were made of samples for environmental testing.
6. The Environmental Protection Agency seven basic tests and their maximum limits of 1971 are:

| | |
|---|---|
| Volatile solids | 6.00% dry weight |
| Chemical Oxygen Demand (C.O.D.) | 5.00% dry weight |
| Total Kjeldahl nitrogen | 0.10% dry weight |
| Oil and grease | 0.15% dry weight |
| Mercury (Hg) | 1.0 parts per million dry weight |
| Lead (Pb) | 50.0 parts per million dry weight |
| Zinc (Zn) | 50.0 parts per million dry weight |

7. E.P.A. Ocean Dumping Criteria published 16 May 73 in the Federal Register Vol. 38 No. 94, Part II, pages 12871 to 12876 supersede the limits shown in note 6. The new criteria reflect the strong reservations within the scientific community to the use of chemical composition of spoil material as the sole indicator of pollution status.

| SYMBOL | DESCRIPTIONS | DATE | APPROVAL |
|---|---|---|---|
| | REVISIONS | | |

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:

DRAWN BY: R U. S.S.C.

CHECKED BY:

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

**DETAILED INVESTIGATION MILE 10.2 TO 11.6**
**LOGS OF PROBES AND TEST HOLES**

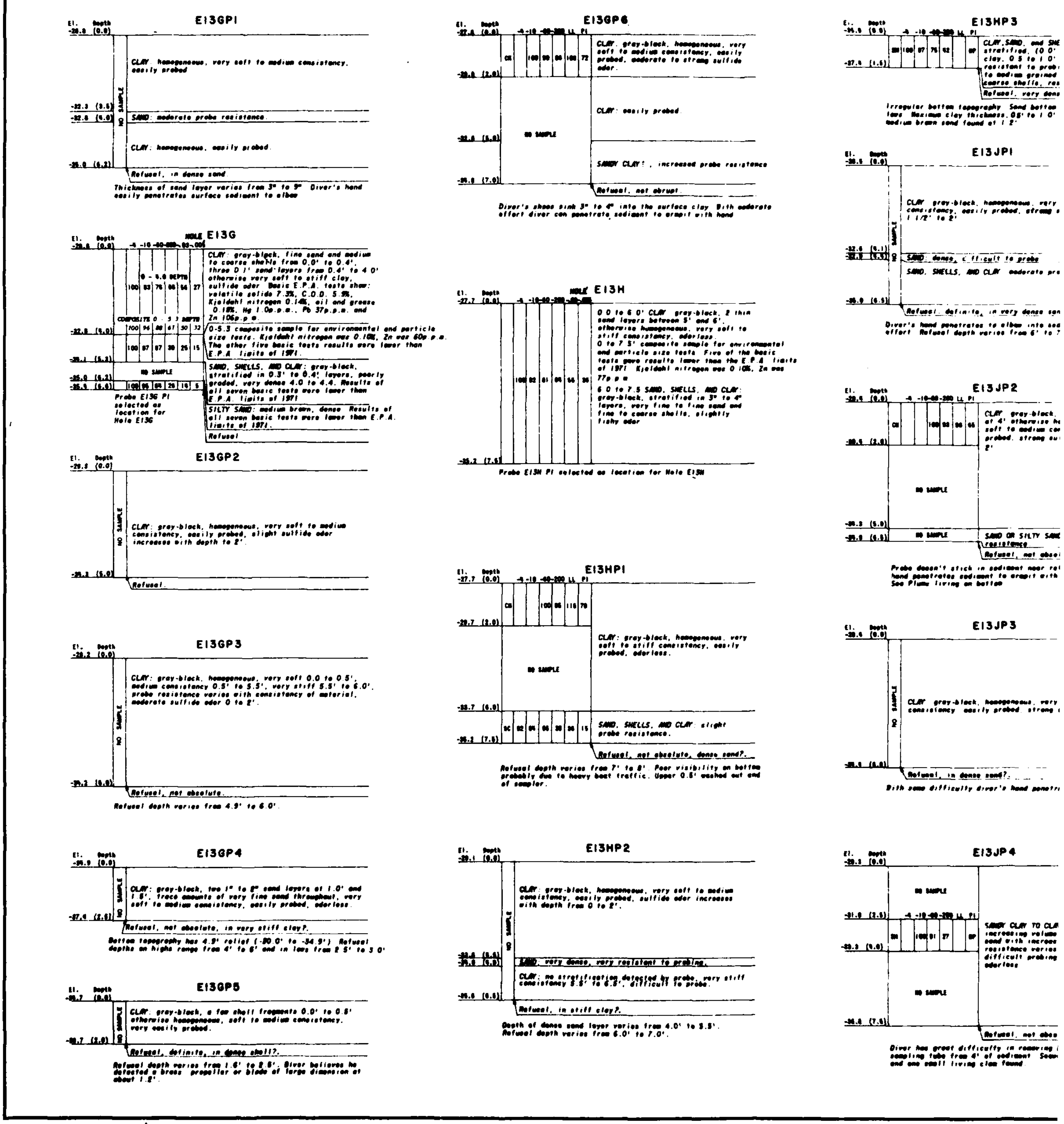
SUBMITTED BY: [signature]
CHIEF, FOUNDATIONS AND MATERIALS BRANCH
DATE: AUGUST 1973

SPEC. NO.
DRAWING NUMBER
DISTRICT FILE NO. D-789
SHEET



2

U.S. ARMY ENGINEER DISTRICT



CORPS OF ENGINEERS

## 3GP6

CLAY gray-black, homogeneous, very soft to medium consistency, easily probed, moderate to strong sulfide odor.

CLAY: easily probed

SANDY CLAY: , increased probe resistance

Refusal, not abrupt.

e 4" into the surface clay. With moderate ate sediment to armpit with hand.

## E13H

0.0 to 6.0' CLAY gray-black, 2 thin sand layers between 5' and 6', otherwise homogeneous, very soft to stiff consistency, odorless.
0 to 7.5' composite sample for environmental and particle size tests. Five of the basic tests gave results lower than the E.P.A. limits of 1971. Kjeldahl nitrogen was 0.10%, Zn was 77p.p.m.
6.0 to 7.5 SAND, SHELLS, AND CLAY: gray-black, stratified in 3" to 4" layers, very fine to fine sand and fine to coarse shells, slightly fishy odor.

as location for Hole E13H.

## 3HP1

CLAY: gray-black, homogeneous, very soft to stiff consistency, easily probed, odorless.

SAND, SHELLS, AND CLAY: slight probe resistance.

Refusal, not absolute, dense sand?.

om 7' to 8'. Poor visibility on bottom oat traffic. Upper 0.5' washed out and

## 3HP2

homogeneous, very soft to medium y probed, sulfide odor increases to 2'.

very resistant to probing.

ation detected by probe, very stiff o 6.5', difficult to probe.

clay?.

er varies from 4.0' to 5.5'. om 6.0' to 7.0'.

## E13HP3

El. -36.0, Depth (0.0)

| | -4 | -10 | -40 | -200 | LL | PI |
|---|---|---|---|---|---|---|
| SM | 100 | 97 | 75 | 42 | | NP |

CLAY, SAND, and SHELLS: gray-black, stratified, (0.0' to 0.5' homogeneous clay, 0.5 to 1.0' fine sand and shells, resistant to probing, 1.0 to 1.5' fine to medium grained sand and medium to coarse shells, resistant to probing), odorless

-37.5 (1.5) Refusal, very dense sand?.

Irregular bottom topography. Sand bottom on highs, clay bottom in lows. Maximum clay thickness, 0.5' to 1.0'. One 2" piece of cemented medium brown sand found at 1.2'.

## E13JP1

El. -30.5, Depth (0.0)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, strong sulfide odor from 1 1/2' to 2'.

-32.6 (4.1) / -32.8 (4.3) SAND: dense, difficult to probe.

SAND, SHELLS, AND CLAY: moderate probe resistance

-36.0 (6.5) Refusal, definite, in very dense sand?.

Diver's hand penetrates to elbow into sediment with moderate effort. Refusal depth varies from 6' to 7'.

## E13JP2

El. -28.5, Depth (0.0)

| | -4 | -10 | -40 | -200 | LL | PI |
|---|---|---|---|---|---|---|
| CH | | | 100 | 98 | 98 | 56 |

CLAY: gray-black, one thin sand layer at 4' otherwise homogeneous clay, soft to medium consistency, easily probed, strong sulfide odor 1 1/2 to 2'

-30.5 (2.0)

NO SAMPLE

-34.2 (5.0)

NO SAMPLE

SAND OR SILTY SAND: moderate probe resistance.

-35.0 (6.5) Refusal, not absolute.

Probe doesn't stick in sediment near refusal depth. Diver's hand penetrates sediment to armpit with moderate effort. Sea Plume living on bottom.

## E13JP3

El. -28.4, Depth (0.0)

NO SAMPLE

CLAY: gray-black, homogeneous, very soft to medium consistency, easily probed, strong sulfide odor 1' to 2'

-35.4 (8.0) Refusal, in dense sand?.

With some difficulty diver's hand penetrates sediment to elbow.

## E13JP4

El. -29.3, Depth (0.0)

NO SAMPLE

-31.8 (2.5)

| | -4 | -10 | -40 | -200 | LL | PI |
|---|---|---|---|---|---|---|
| SM | | 100 | 81 | 27 | | NP |

SANDY CLAY TO CLAYEY SAND: gray-black, increasing volume of fine micaceous sand with increasing depth, probe resistance varies with sand volume, difficult probing 3 1/2' to 7 1/2', odorless.

-33.3 (4.0)

NO SAMPLE

-36.8 (7.5) Refusal, not absolute.

Diver has great difficulty in removing 2 1/2" diameter plastic sampling tube from 4' of sediment. Seaweed growing on bottom and one small living clam found.

## E13KP1

El. -29.2, Depth (0.0)

NO SAMPLE

CLAY golden brown 0.0' to 0.5' then gray-black, homogeneous, very soft to medium consistency, easily probed, sulfide odor increases with depth from 0' to 2', at 2' sulfide odor is strong

-36.2 (7.0) Refusal, definite, on very hard shell? surface

Diver's hand penetrates sediment to elbow with moderate effort

## E13KP2

El. -29.4, Depth (0.0)

NO SAMPLE

CLAY gray-black, very small amount of very fine sand uniformly distributed throughout, very soft to medium consistency, easily probed, slight sulfide odor from 0 to 2'

-33.4 (4.0)

SAND AND CLAY: homogeneous, slight probe resistance

-35.4 (6.0) Refusal, not absolute

In some probes sand and clay layer was not detected and all 6.0' was easily probed clay.

NOTES:

1. A hard hat diver made all probes and holes by using hand operated equipment.
2. Continuous voice communication was ava able between the geologist on board and the diver on the bottom.
3. Each probe description is based on diver's comments while penetrating with a 5/16" metal rod at several points within the radius of visibility at the probe location, inspection of occasional informal samples the diver secured with a 2 1/2" I.D. plastic tube 3' long whenever requested, and consideration of samples recovered at holes for environmental test samples.
4. A probe with substantial penetration was selected in each of six sections as the location for a formal hole to sample for the maximum series of tests of environmental qualities. Test results are given in Report I 4.
5. The Unified Soils Classification is described on PLATE I-3. Classification tests were made on several of the samples recovered for inspection. Tests with distribution of particle sizes smaller than the No. 200 sieve were made of samples for environmental testing.
6. The Environmental Protection Agency seven basic tests and their maximum limits of 1971 are:

| | | |
|---|---|---|
| Volatile solids | | 6.00% dry weight |
| Chemical Oxygen Demand (C.O.D.) | | 5.00% dry weight |
| Total Kjeldahl nitrogen | | 0.10% dry weight |
| Oil and grease | | 0.15% dry weight |
| Mercury (Hg) | 1.0 | parts per million dry weight |
| Lead (Pb) | 50.0 | parts per million dry weight |
| Zinc (Zn) | 50.0 | parts per million dry weight |

7. E.P.A. Ocean Dumping Criteria published 16 May 73 in the Federal Register, Vol. 38, No. 94, Part II, pages 12871 to 12876 supersede the limits shown in note 6. The new criteria reflect the strong reservations within the scientific community to the use of chemical composition of spoil material as the sole indicator of pollution status

| SYMBOL | DESCRIPTIONS | DATE | APPROVAL |
|---|---|---|---|

REVISIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:

DRAWN BY: R U SSC

CHECKED BY:

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

# DETAILED INVESTIGATION MILE 10.2 TO 11.6
# LOGS OF PROBES AND TEST HOLES

SUBMITTED BY: [signature]
CHIEF, FOUNDATION AND MATERIALS BRANCH

DATE: AUGUST 1973

SPEC. NO.

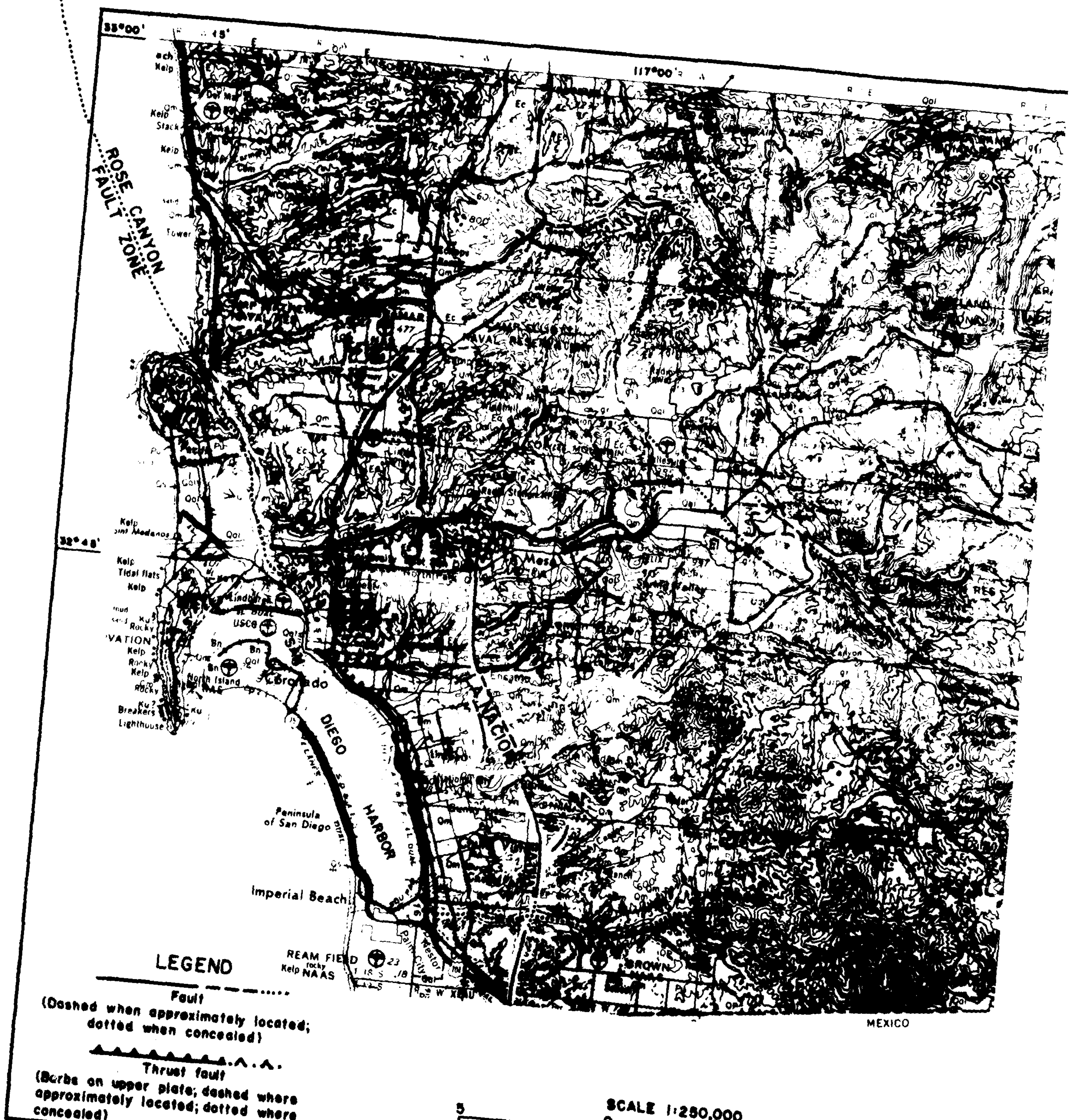
DRAWING NUMBER

DISTRICT FILE NO. D-760

SHEET

2

PLATE I-6


33°00'
117°00'
32°45'
ROSE CANYON FAULT ZONE
Kelp
Tidal flats
Coronado
North Island
Breakers
Lighthouse
DIEGO
HARBOR
Peninsula of San Diego
Imperial Beach
REAM FIELD
NAAS
BROWN
MEXICO
LEGEND
Fault
(Dashed when approximately located; dotted when concealed)
Thrust fault
(Barbs on upper plate; dashed where approximately located; dotted where concealed)
SCALE 1:250,000
5
0
5
10 STATUT


MEXICO

,000

5

10 STATUTE MILES

NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR
SAN DIEGO COUNTY, CALIFORNIA

## REGIONAL STRUCTURAL GEOLOGY

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

FILE NO. D-761 2 PLATE I-7

APPENDIX 2

REMOVAL AND RELOCATIONS
OF UTILITIES

SAN DIEGO HARBOR,
CALIFORNIA

APPENDIX 2

REMOVAL AND RELOCATIONS OF UTILITIES

SAN DIEGO HARBOR, CALIFORNIA

CONTENTS



TABLES



PLATES

## REMOVAL AND RELOCATION OF UTILITIES

1. SCOPE. In accordance with the project document, local interests are responsible for the relocation of all public utilities, and the U.S. Navy is responsible for relocating its utilities. Removal and relocation of these utilities will be discussed as separate items in this appendix.

### PUBLIC UTILITIES

2. GENERAL. The San Diego Unified Port District has qualified itself as the local sponsoring agency for this project. Relocation of all utilities and dredging within the utility area will be closely coordinated with the sponsoring agency during progressive stages of construction of the project. All utilities that would interfere with and/or be adversely affected by the project are itemized and described in table 2-1. After project authorization, the California American Water Company replaced in 1969 their 18-inch waterline with a 24-inch line. The location of all public utilities are shown in plate 2-1.

3. DESCRIPTION. Removal and relocation or abandonment and removal will be required for all utilities that are located within the right-of-way of the proposed channel which would interfere with the channel dredging. Widths to which the utilities are to be relocated will be those which are necessary for the safe usage by vessels of the channel. All abandoned public utilities will be removed at the expense of the utility owner and at the direction of local interests, except an 8-inch waterline owned by California American Water Company. The 8-inch waterline was installed prior to the enactment of the River and Harbor Act of 1889; therefore, the responsibility of the owner for removal of this line from the channel if the line is abandoned, is not clear. The California American Water Company will abandon this line and the Unified Port District has assumed responsibility to remove it from the channel. Local interests have coordinated a joint relocation agreement with the owners of the public utilities for the utility relocation. This schedule, given in table 2-2, calls for incremental construction. Under this schedule, the first step involves the removal of utilities. Secondly, the channel will be dredged to project depth by the Contractor performing the channel dredging. Lastly, the utilities will be relocated in the area just dredged. This sequence will be repeated three separate times to accomplish the relocation of all the public utilities. The dredging schedule given in table 2-2 will be incorporated into the plans and specifications for the construction of this project. Dredging beyond project depths for any utility which must be buried is the responsibility of local interests.

4. This dredging schedule provides for the orderly removal and replacement of utilities without any interruption in utility services to the City of Coronado and to North Island Naval Air Station.

### NAVY UTILITIES

5. GENERAL. The U.S. Navy owns three utility lines that cross in the area of the proposed project. These lines, if left in place, would interfere with the construction of the project. The location of these utilities are shown on plate 2-2 in this appendix.

6. DESCRIPTION. Subsequent to project authorization, the U.S. Navy negotiated a long-term usage agreement for sewer service with the City of Coronado. Construction on this line was completed in fiscal year 1972. This construction nullified the Navy's need to maintain and to build a sewerline from San Diego, California, to Coronado Island. The Navy plans to construct a 24-inch waterline to replace the existing 20-inch and 16-inch waterlines between Coronado and San Diego. Work on this project is scheduled for fiscal year 1975. The Navy will be responsible for the removal of the abandoned sewerline and the 16-inch and 20-inch waterlines.

7. The Navy will coordinate their removal of abandoned utility lines and construction of the new 24-inch waterline with the removal and relocation plan for the public utilities as described in table 2-2 of this appendix.

Table 2-1

| UTILITIES SAN DIEGO HARBOR, CALIFORNIA | | |
|---|---|---|
| **Owner** | **Feature** | **Remarks** |
| U.S. Navy | 16" water line | To be abandoned and removed |
| U.S. Navy | 20" water line | To be abandoned and removed |
| U.S. Navy | 18" sewer line | To be abandoned and removed |
| U.S. Navy | 24" water line | New installation |
| San Diego Gas & Electric Co. | 12KV CKTS 111, 115B & 117B | To be abandoned and removed |
| San Diego Gas & Electric Co. | Two 4" gas lines | To be abandoned and removed |
| San Diego Gas & Electric Co. | 10" gas line | To be relocated |
| San Diego Gas & Electric Co. | 69KV CKT | New installation |
| San Diego Gas & Electric Co. | 69KV CKT 655 | To be relocated |
| San Diego Gas & Electric Co. | 12KV CKTS 115A 117A | To be abandoned and removed |
| San Diego Gas & Electric Co. | 6" gas line | To be abandoned and removed |
| Pacific Telephone Co. | 300-PR & 900-PR cable (Westerly) | To be relocated |
| Pacific Telephone Co. | 900-PR cable | New installation |
| Pacific Telephone Co. | 150-PR cable | To be abandoned and removed |
| Pacific Telephone Co. | 300-PR & 900-PR cable | To be relocated |
| Cal American Water Co. | 18" water line | Removed and replaced in 1969 |
| Cal American Water Co. | 8" water line | Line will be abandoned by Cal American and removed by Unified Port District |

(See Plate 2-1 for location of these facilities)

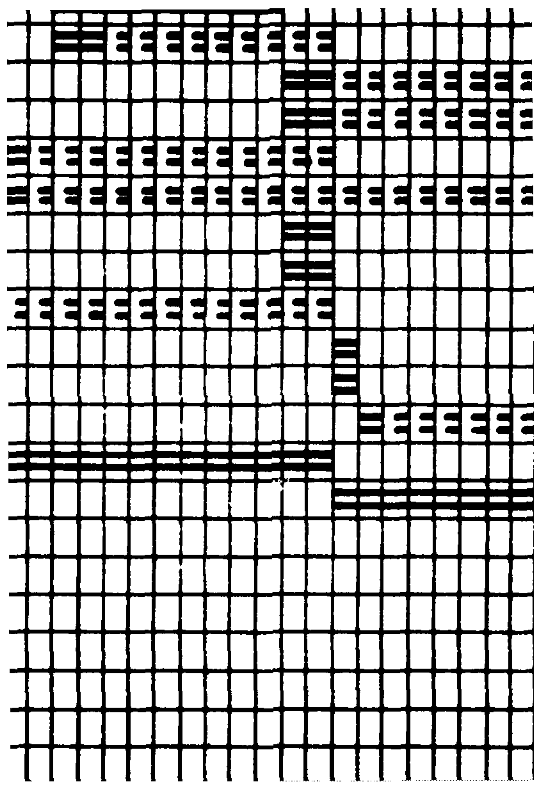
| | −5 | D |
|---|---|---|
| C OF E ADVERTISE, BID AND AWARD DREDGING CONTRACT | | |
| PAC TEL MOVE 1100-PR CABLE FROM AREA "A" TO AREA "C" | | |
| SDG & E REMOVE 4-IN. ABANDONED GAS LINE, AREA "A" | | |
| C OF E DREDGE AREA "A" | | |
| NAVY INSTALL 24-IN. WATER LINE, AREA "A" | | |
| NAVY REMOVE 18-IN. SEWER LINE, AREA "B" | | |
| NAVY REMOVE 16-IN. WATER LINE, AREA "C" | | |
| NAVY REMOVE 20-IN. WATER LINE, AREA "D" | | |
| SDG & E REMOVE 4-IN. ABANDONED GAS LINE, AREA "B" | | |
| SDG & E REMOVE 6-IN. ABANDONED GAS LINE, AREA "D" | | |
| PAC TEL RELOCATE 300 & 900 PR CABLES FROM AREA "B" TO AREA "A" | | |
| PAC TEL RELOCATE 1100-PR CABLE FROM AREA "C" TO AREA "A" | | |
| PAC TEL REMOVE 150-PR CABLE, AREA "B" | | |
| C OF E REMOVE 8-IN. WATER, LINE AREA "B" | | |
| C OF E DREDGE AREA "B" | | |
| PAC TEL RELOCATE 300 & 900 PR CABLES FROM AREA "D" TO AREA "B" | | |
| SDG & E PROCURE 69 KV CABLE | | |
| SDG & E INSTALL NEW 69 KV CKT IN EXISTING 6-IN. CONDUIT, AREA "D" | | |
| SDG & E REMOVE 12 KV CKTS 111, 115 B & 117 B, AND 69KV CKT TL 655, AREA "C" | | |
| C OF E DREDGE AREA "C" | | |
| SDG & E INSTALL 69KV CKT TL 655, AREA "C" | | |
| SDG & E REMOVE 12 KV CKTS 115A & 117A, AREA "D" | | |
| SDG & E REMOVE PORTION OF 10-IN GAS LINE, AREA "D" | | |
| C OF E DREDGE AREA "D" | | |
| SDG & E REINSTALL PORTION OF 10-IN GAS LINE, AREA "D" | | |

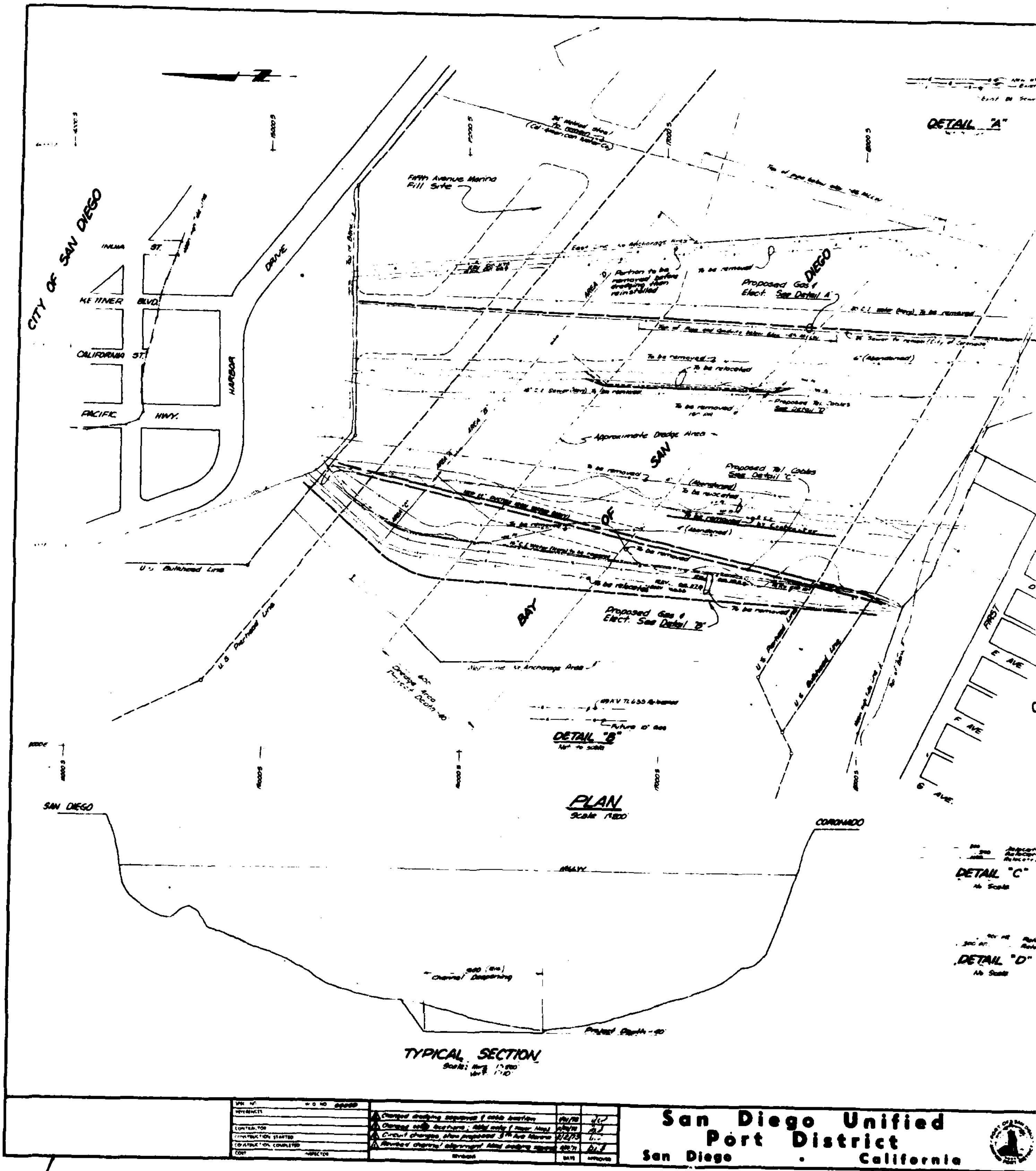
D = DATE OF AWARD OF DREDGING CONTRACT BY CORPS OF ENGINEERS
SEE PORT DISTRICT DRAWING 1016 FOR LOCATION OF TRANSBAY UTILITIES AND DREDGING AREAS "A", "B", "C", AND "D"

SAN D

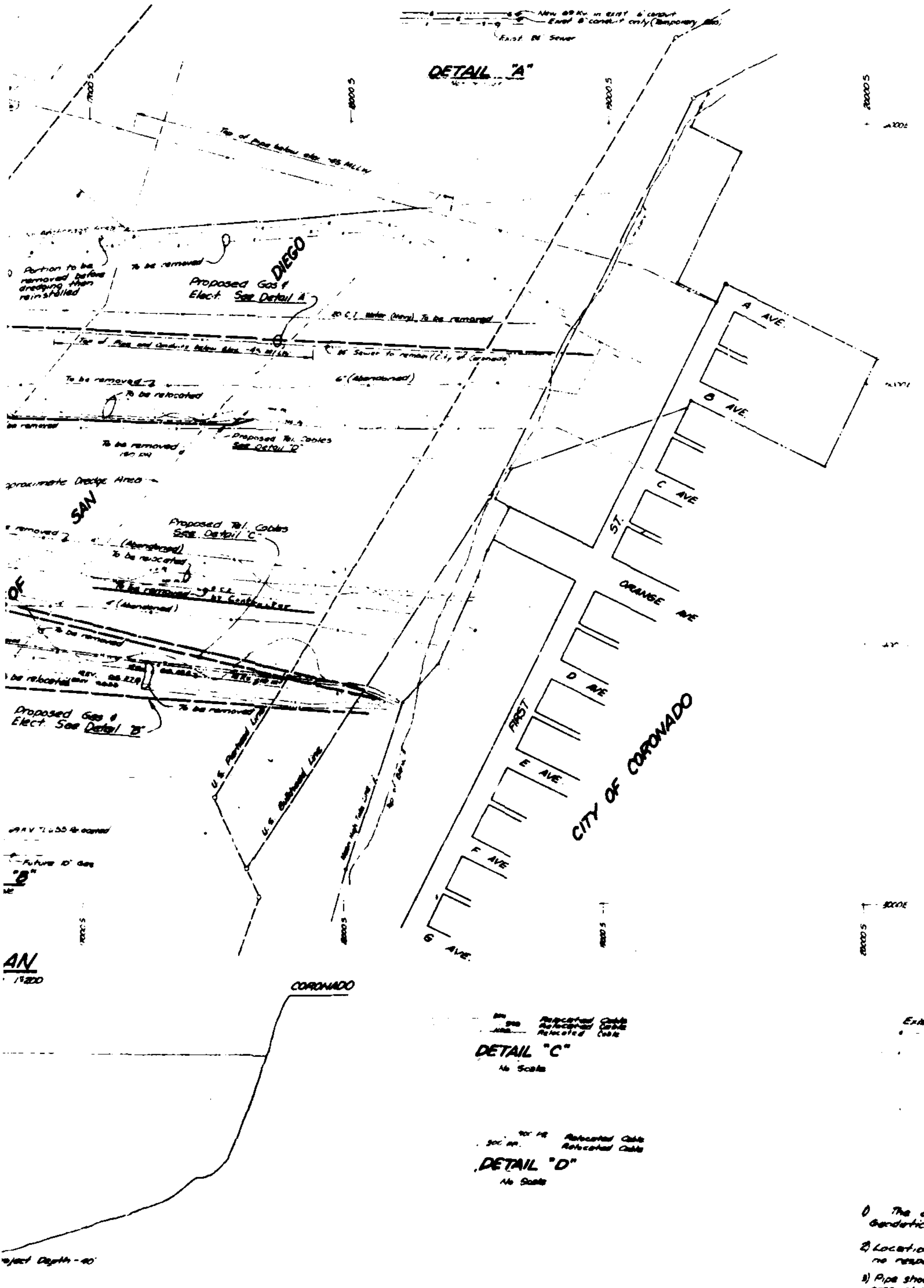
DRED

RELOCA





CITY OF SAN DIEGO
INDIA ST.
KETTNER BLVD.
CALIFORNIA ST.
PACIFIC HWY.
HARBOR DRIVE
Fifth Avenue Marina Fill Site
DETAIL "A"
SAN DIEGO BAY
Proposed Gas & Elect. See Detail A
To be removed
To be relocated
Approximate Dredge Area
Proposed Tel Cables See Detail "C"
(Abandoned)
Proposed Gas & Elect. See Detail "B"
U.S. Bulkhead Line
U.S. Pierhead Line
DETAIL "B"
Not to scale
FIRST
E AVE
F AVE
G AVE.
PLAN
Scale 1"=800'
SAN DIEGO
CORONADO
MLLW
DETAIL "C"
No Scale
DETAIL "D"
No Scale
Channel Deepening
Project Depth -40'
TYPICAL SECTION
San Diego Unified Port District
San Diego • California




## LEGEND

| Existing | | Utility Company | Ph. No |
|---|---|---|---|
| | Gas | San Diego Gas & Electric Co. (714) 232-4252 Ext. 1100 | |
| | Electric | " " " " " | |
| | Telephone | Pacific Telephone & Telegraph Co. (714) 565-0448 | |
| | Water | Cal-American Water Co. (714) 422-9885 | |

## NOTES

1) The origin of coordinates being the U.S. Coast and Geodetic Survey Station "OLD TOWN".

2) Locations of submarine facilities are approximate; no responsibility is assumed as to true location.

3) Pipe shown "to be removed" is to be removed from the dredge area plus 100 feet on each side.

4) Dredging sequence Area "A", Area "B", Area "C" and Area "D"

PRINTED
FEB 3
PORT OF SAN DIEGO

**San Diego Unified Port District**
**San Diego • California**

Drawn: R. J. Gallman
Checked: D. G. Forrest
Approved: J. E. Kirk, Aug 5, 71, Chief Engineer

# SUBMARINE UTILITIES
Between
SAN DIEGO & CORONADO

Datum: Mean Lower Low Water
Sheet 1 of 1
1016
Rev. 4

**APPENDIX 3**

**ECONOMIC STUDY**

**SAN DIEGO HARBOR, CALIFORNIA**

APPENDIX 3 - ECONOMIC STUDY

SAN DIEGO HARBOR, CALIFORNIA

CONTENTS

## TABLES



## GRAPHS



## PLATES

## APPENDIX 3 - ECONOMIC STUDY
## SAN DIEGO HARBOR, CALIFORNIA

### SCOPE

1. The studies described in this appendix were made to determine future potential tonnage that can be expected to flow through San Diego Harbor, California, for which improvements are being recommended in the main report. It is noted that projections of waterborne commerce do not include trade with mainland China.

### TRIBUTARY AREA

2. DESCRIPTION. The commercial tributary area of San Diego Harbor consists of a general tributary area and an immediate tributary area. (See accompanying map.) The immediate tributary area is composed of San Diego County and Imperial County. On the basis of destination and point of origin of shipment east of California, the general tributary area is considered to include the southern half of Arizona, New Mexico (with the exclusion of the eight northernmost counties), west Texas, and the Mexican States of Chihuahua, Sonora and Baja California Norte. West Texas consists of seven westernmost counties. The Mexican State of Baja California Norte comprises the northern half of the peninsula of Baja California and contains 90 percent of the peninsula's population.

3. As the people of Mexico continue to receive larger real income, it is expected that more goods from the Orient, the United States, and other countries will be purchased for re-export to Mexico. It is anticipated that San Diego Harbor, due to its proximity to Mexico, will receive a heavy share of this future growth in commerce.

4. DETERMINATION OF AREA LIMITS. The commercial tributary area was determined by analyzing destination and points of origin for imports and exports, as shown by bills of lading for substantial shipments. (This information was obtained from officials of the Port of San Diego and by conversations with area shippers of large tonnages.) From this locus, the shortest rail and trucking distances to the Port of San Diego were used to set the geographical limits of the commercial tributary area. Generally, the combined rail and truck-shipping costs added to the waterborne costs will determine the economical limits of the tributary area.

5. The Port of San Diego has made special efforts to attract cotton shipments and bulk shipment of ores, livestock feeds, and fertilizers. This has, as a result, established new and definite markets within the prescribed limits of the tributary area. Cotton from Arizona and southern California, raw fertilizer material from New Mexico, and copper and nickel ore from Arizona and other Western States have been recent items of export. The completion of a bulk loader in 1962 at the Port of San Diego, has stimulated and increased this export trade from these areas. Container cargo trebled in the first 5 months of 1971. A 700-ton container crane, acquired at a cost estimated at $1,300,000 and capable of single hook lifts of 40 long tons, was placed in operation at National City Terminal during 1974. This should add significantly to container cargo handled by the Port, previously handled by portable dockside cranes, a floating crane and ships' gear.

## POPULATION OF TRIBUTARY AREA

6. GENERAL. The population of the commercial tributary area (excluding Mexico) has shown a steady growth since 1900, and this growth is expected to continue in the forseeable future. The 1970 census of the area indicated that the population was 4,228,000, which represented a 23 percent increase over the 1960 census of 3,434,000. Pertinent population data obtained from the Bureau of Census (United States and Mexico) are given in table 3-1.

TABLE 3-1

Historical population for areas tributary to San Diego, California
and for other areas in the United States
1940-1970
(In thousands)

| Area | 1940 | 1950 | 1960 | 1970 |
|---|---|---|---|---|
| Annual tributary area: | | | | |
| Immediate tributary area | 349 | 620 | 1105 | 1425 |
| General tributary area (excluding Mexico) | 999 | 1432 | 2329 | 2803 |
| Subtotal | 1348 | 2052 | 3434 | 4228 |
| General tributary area in Mexico | 1067 | 1584 | 2605 | -- |
| Total | 2415 | 3636 | 6039 | -- |
| Other areas: | | | | |
| City of San Diego | 203 | 334 | 573 | 697 |
| San Diego County | 289 | 557 | 1033 | 1359 |
| State of California | 6907 | 10,586 | 15,717 | 20,009 |
| United States | 132,165 | 151,326 | 179,323 | 203,230 |

Sources: U.S. Bureau of the Census and Mexico Census Bureau.

7. FUTURE POPULATION. Projections of future population were made for the immediate tributary and the general tributary areas, excluding that portion of Mexico that lies within the tributary area. (See table 3-2.) However, the population growth of this segment of Mexico is expected to continue at the same increasing rate, primarily because of the decline in the infant mortality rate and in-migration northward toward the United States border. The population of the immediate tributary area (San Diego and Imperial Counties) by the year 2020 will approximate 3,743,000. For the same year, the population of the commercial tributary is projected at 9,102,000 (see graph 3-1). Assuming this tremendous population growth in the commercial tributary area, an increased amount of general cargo will be required to satisfy the needs of this large population.

8. IMMEDIATE TRIBUTARY AREA. The immediate tributary area is composed of two very distinct regions, San Diego County and Imperial County, the resources of which contribute to the market diversification of the tributary area. As indicated in the following subparagraphs, the basic sources of employment and income of each county differ, owing to their contrasting economic base. The community of Escondido is considered to be the center of population of this area, located approximately 32 miles northeast of the harbor.

TABLE 3-2

Projected population for areas tributary to San Diego Harbor, California,
and for other areas in the United States
1980-2020
(In thousands)

| Area | 1930 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|
| Commercial tributary area: | | | | | |
| Immediate tributary area | 1874 | 2352 | 2765 | 3242 | 3743 |
| General tributary area (excluding Mexico) | 3301 | 3824 | 4287 | 4812 | 5359 |
| Total | 5175 | 6176 | 7052 | 8054 | 9102 |
| Other areas: | | | | | |
| City of San Diego | 857 | 996 | 1100 | -- | -- |
| San Diego County | 1791 | 2235 | 2652 | 3111 | 3590 |
| State of California | 23,549 | 28,188 | 32,567 | 37,657 | 43,004 |
| United States | 234,208 | 269,759 | 306,782 | 350,111 | 399,013 |

Sources: State 71, OBERS 1972 and San Diego City Planning Department.

a. San Diego County. San Diego County is located in the southwest corner of California. The temperate climate and the desirability of the locale have drawn large numbers of people to the area. As a result, the expanding labor pool has facilitated the establishment of many new industries within the county. Today, the economy is less dependent on the aircraft industry (less than 7 percent of all the jobs) than in previous years. Tourism, the manufacture of scientific and electronic equipment, and research and development activities are playing an increasingly important role in the San Diego economy. The availability of a good port in San Diego is a valuable asset to the industrial and manufacturing sectors of the county's economy in relation to their competitive position in the national and international market place. Moreover, the port serves more than 500,000 acres in San Diego County which are devoted to agriculture, though the value of all farm products sold – in excess of $143,000,000, in 1970 – does not nearly approach that of its neighbor, Imperial County, which has approximately 500,000 acres in agriculture with a value of farm products in excess of $257,000,000.

b. Imperial County. Imperial County is characterized by a warm, dry climate and by vast desert expanses. Agriculture has been the major source of economic growth and development, placing Imperial County fifth among all counties in the United States by value of all farm products sold. The favorable climate enables growers to raise two and three crops per year, as well as off-season fruits and vegetables. In 1970, almost $61 million worth of vegetables was marketed from Imperial County. Agricultural employment comprises about 31 percent of the employment profile. As in other farm areas, this percentage has been decreasing due to improved farming techniques and technology. Most of the manufacturing within the county is related to agriculture - such as food-processing establishments, cotton gins, and agricultural feed production. Alfalfa pellets and cotton, the major agricultural commodities of Imperial County, are shipped from the Port of San Diego to the Far East. The continued expansion of Imperial County's use of the Port of San Diego for agricultural shipments will depend upon the amount of water which is available for the future expansion of the county's agricultural base.

9. GENERAL TRIBUTARY AREA. Within the general tributary area, there are three large expanding metropolitan areas: Phoenix, Arizona; Tucson, Arizona; and El Paso, Texas. They are in Maricopa, Pima, and El Paso Counties, respectively. The first two counties are in Arizona, the second fastest-growing State. The level of Arizona's economic activity has been rapidly advancing since 1953, yet it is difficult to select any one particular major spur to its economic growth. Mining, manufacturing, agriculture, trade, and services – all have played an important role in placing Arizona where it is today.

10. The manufacturing sector has been the greatest contributor to Arizona's income, supplying $2,010,000,000 in 1969. Three out of every five of the State's manufacturing firms are located in Maricopa County. Machinery, instruments, primary metal industries, and electronic items dominate the manufacturing activity. Although there has been some noticeable slack between the total labor force and the total number employed in the commodity producing industries in the past years, this gap has diminished somewhat in the first-half of 1969 and the prospects for continued growth in future years seem favorable.

11. Mining is the second major source of Arizona's income, contributing almost $860,000,000 in 1969. Domestic extractive industries provide the greater proportion of raw materials to the State's industrial sector, as well as being a chief supplier to world markets. Fifty-two percent of the nation's copper production is centered in Arizona, principally in Pima County. Mineral exploration and development have increased steadily, particularly in Greenlee, Pima and Pinal Counties. The Port of San Diego serves the mining firms of Arizona by providing an outlet to world markets.

12. Employment in Arizona's wholesale and retail trade has risen from 39,700 in 1950 to 128,000 in 1970. This growth reflects the need for accommodating the State's rapidly increasing population.

13. That part of New Mexico that is within the tributary area (see map) is characterized by broad valleys and fertile soil. The principal crops in the State, in order of value, include hay, cotton lint, sorghum grain and lettuce. The value of all farm products sold in 1968 was approximately $322,000,000 a figure indicative of a flourishing agricultural State. In the same year, New Mexico ranked seventh among all States in value of mineral production. Petroleum, uranium, natural gas and copper were the four leading products.

14. El Paso County is located at the extreme western end of Texas, at that point where the New Mexico and Republic of Mexico boundaries meet. The extensive air, rail and highway networks that cover the county are indicative of a thriving trade center. El Paso is chiefly known as a wholesale distribution and cattle center. This often overshadows the important role agriculture plays in the economy. Seventy-seven percent of total land in the county, or 518,000 acres, is devoted to agriculture. The value of farm products sold in 1970 was approximately $26,000,000. The climate, which is characteristic of nearly all of Texas, affords the growing of most plants that are generally found in temperate and subtropical regions. The manufacturing sector is predominately concentrated with light, clean industries.

15. As the population grows in the southwest, the regional manufacture of durable goods will be increased. This, in turn, will furnish more employment and will strengthen and balance the local economies. As these local economies in the commercial tributary area become stronger and more numerous, the resulting increase in strength and diversification of the regional economy will invariably lead to increased commercial traffic with the Port of San Diego.

a. Waterborne Commerce. The volume of commerce in San Diego Harbor, exclusive of cargo moved in Department of Defense vessels, for the period of 1960 through 1971, is shown in table 3-3. Historic imports and exports by commodity, foreign and domestic for the period of 1950 through 1972 are shown in table 3-4. The sudden decline in petroleum products was due to the installation of a petroleum pipeline between Los Angeles and San Diego. The petroleum that is presently being transported by tanker is mostly heavier fuels and is expected to continue in future years.

TABLE 3-3

Volume of commerce, San Diego Harbor, Calif. - in 1,000 tons

| Year | Petroleum | Molasses | Fish and fish products | All other | Total |
|---|---|---|---|---|---|
| 1960 | 1,649 | 0 | 31 | 456 | 2,136 |
| 1961 | 1,582 | 0 | 30 | 446 | 2,058 |
| 1962 | 1,726 | 46 | 33 | 495 | 2,267 |
| 1963 | 1,024 | 65 | 33 | 735 | 1,838 |
| 1964 | 560 | 79 | 28 | 907 | 1,574 |
| 1965 | 656 | 26 | 36 | 940 | 1,658 |
| 1966 | 712 | 68 | 36 | 1,090 | 1,906 |
| 1967 | 497 | 88 | 44 | 1,108 | 1,737 |
| 1968 | 476 | 60 | 38 | 1,119 | 1,693 |
| 1969 | 543 | 86 | 40 | 1,251 | 1,920 |
| 1970 | 651 | 76 | 38 | 1,307 | 2,072 |
| 1971 | 750 | 51 | 41 | 967 | 1,809 |
| Total | 10,826 | 645 | 428 | 10,821 | 32,568 |
| Average | 902 | 54 | 36 | 902 | 1,881 |
| (1966-1971) Average | 605 | 72 | 40 | 1,140 | 1,856 |

TABLE 3-4

Historical Imports and
Exports by Commodities Foreign and
Domestic – San Diego Harbor in Short Tons

Farm Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 109 | 47 | 47 | | 15 |
| 1955 | 60,325 | 59,949 | 306 | 19 | 51 |
| 1960 | 81,739 | 64,352 | 17,292 | | 95 |
| 1961 | 101,783 | 84,874 | 16,909 | | |
| 1962 | 69,423 | 46,681 | 22,735 | | 7 |
| 1963 | 97,710 | 76,226 | 21,082 | | 402 |
| 1964 | 99,711 | 73,310 | 25,526 | | 875 |
| 1965 | 54,188 | 54,013 | 175 | | |
| 1966 | 35,187 | 35,172 | 15 | | |
| 1967 | 39,596 | 39,311 | 285 | | |
| 1968 | 26,512 | 21,166 | 5,346 | | |
| 1969 | 22,143 | 22,042 | 101 | | |
| 1970 | 23,850 | 23,276 | 574 | | |
| 1971 | 34,478 | 32,694 | 1,784 | | |
| 1972 | 15,464 | 15,317 | 147 | | |

Forest Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1955 | 14 | | 14 | | |
| 1960 | 44 | | 42 | | 2 |
| 1961 | 7 | | 7 | | |
| 1962 | 64 | | 64 | | |
| 1963 | 11 | | 11 | | |
| 1964 | 19 | | 19 | | |
| 1965 | 19,173 | 2,618 | 16,555 | | |
| 1966 | 145,995 | 2,651 | 21,344 | | 122,000 |
| 1967 | 17,810 | 932 | 16,878 | | |
| 1968 | 32,703 | 5,093 | 27,610 | | |
| 1969 | 24,978 | 4,978 | 20,000 | | |
| 1970 | 29,995 | | 29,995 | | |
| 1971 | 28,443 | 4 | 28,439 | | |
| 1972 | 26,476 | | 26,476 | | |

TABLE 3-4 (Continued)

Fresh Fish and Shellfish

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1955 | 5,168 | 177 | 4,991 | | |
| 1960 | 467 | 38 | 429 | | |
| 1961 | 15,598 | 1,319 | 14,275 | 4 | |
| 1962 | 3,795 | 37 | 3,749 | 9 | |
| 1963 | 10,922 | 3,374 | 7,548 | | |
| 1964 | 3,731 | 409 | 3,314 | 8 | |
| 1965 | 5,858 | | 5,858 | | |
| 1966 | 35,675 | | 3,189 | | 32,486 |
| 1967 | 4,067 | 400 | 3,667 | | |
| 1968 | 3,545 | | 3,545 | | |
| 1969 | 5,938 | 1,212 | 4,726 | | |
| 1970 | 5,784 | 1 | 5,783 | | |
| 1971 | 2,869 | 110 | 2,759 | | |
| 1972 | 4,261 | | 4,261 | | |

Metalic Ores

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1955 | 21 | 21 | | | |
| 1960 | 1,244 | 1,153 | 91 | | |
| 1961 | 647 | 603 | 44 | | |
| 1962 | 376 | 365 | 11 | | |
| 1963 | 502 | 502 | | | |
| 1964 | 1,511 | 1,511 | | | |
| 1966 | 54 | 54 | | | |
| 1967 | 7,880 | 7,880 | | | |
| 1968 | 896 | 896 | | | |
| 1969 | 2,765 | 2,765 | | | |

TABLE 3-4 (Continued

Crude Petroleum

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1961 | 1,448,496 | | 1,370,720 | 16,707 | 61,069 |
| 1963 | 2,394,486 | | 1,730,260 | | 664,226 |
| 1968 | 18,527 | | 18,527 | | |

Non-Metalic Minerals

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 173 | | | | 173 |
| 1955 | 1,415 | | 1,411 | | 4 |
| 1960 | 1,083 | 548 | 433 | | 102 |
| 1961 | 157 | | 157 | | |
| 1962 | 2,465 | 263 | 2,142 | 60 | |
| 1963 | 2,348 | 187 | 2,161 | | |
| 1964 | 825 | 783 | 30 | 12 | |
| 1965 | 658 | | 651 | 7 | |
| 1966 | 716 | | 716 | | |
| 1967 | 173 | 172 | 1 | | |
| 1968 | 30,561 | 30,560 | 1 | | |
| 1969 | 13,819 | 13,808 | 11 | | |
| 1970 | 11,826 | 11,814 | 12 | | |
| 1971 | 27,835 | 27,815 | 20 | | |
| 1972 | 4,023 | 2,723 | 1,300 | | |

Ordiance

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1965 | 3 | 3 | | | |
| 1966 | 812 | | | 787 | 25 |
| 1970 | 3 | | 3 | | |

TABLE 3-4 (Continued)

Food and Kindred Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 440 | 19 | | | 421 |
| 1955 | 12,975 | 9,899 | 657 | | 2,419 |
| 1960 | 18,083 | 16,032 | 1,147 | | 904 |
| 1961 | 23,601 | 21,815 | 634 | 586 | 566 |
| 1962 | 65,528 | 11,749 | 34,530 | 22 | 19,227 |
| 1963 | 96,319 | 50,135 | 41,325 | 3,853 | 1,006 |
| 1964 | 137,361 | 60,539 | 37,164 | 12,547 | 27,111 |
| 1965 | 104,890 | 80,311 | 18,765 | 99 | 5,715 |
| 1966 | 142,024 | 70,781 | 28,452 | 5,558 | 37,233 |
| 1967 | 146,375 | 57,266 | 50,308 | 27 | 38,774 |
| 1968 | 115,176 | 54,314 | 49,317 | 56 | 11,489 |
| 1969 | 114,472 | 27,392 | 68,803 | 5 | 18,272 |
| 1970 | 114,392 | 37,650 | 44,211 | 45 | 32,486 |
| 1971 | 90,989 | 37,378 | 30,326 | | 23,275 |
| 1972 | 128,710 | 12,691 | 69,499 | | 46,520 |

Tobacco Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 11 | | | | 11 |
| 1955 | 8 | | | | 8 |
| 1963 | 1 | 1 | | | |
| 1964 | 1 | 1 | | | |
| 1965 | 1 | 1 | | | |
| 1966 | 3 | 3 | | | |
| 1967 | 1 | 1 | | | |
| 1968 | 1 | 1 | | | |
| 1972 | 1 | 1 | | | |

TABLE 3-4 (Continued)

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| **Basic Textiles** | | | | | |
| 1950 | 139 | 1 | | | 138 |
| 1955 | 464 | 16 | 265 | | 183 |
| 1960 | 1,780 | 60 | 1,677 | | 43 |
| 1961 | 523 | 1 | 522 | | |
| 1962 | 1,248 | 2 | 1,246 | | |
| 1963 | 1,140 | 5 | 1,135 | | |
| 1964 | 1,313 | 6 | 1,307 | | |
| 1965 | 4,495 | 3,572 | 923 | | |
| 1966 | 1,314 | 137 | 1,177 | | |
| 1967 | 2,005 | 484 | 1,521 | | |
| 1968 | 1,649 | 35 | 1,614 | | |
| 1969 | 1,831 | 347 | 484 | | |
| 1970 | 1,010 | 35 | 975 | | |
| 1971 | 1,351 | 124 | 1,227 | | |
| 1972 | 1,879 | 994 | 885 | | |
| **Apparel and Other Finished Textiles** | | | | | |
| 1955 | 805 | | 795 | | 10 |
| 1960 | 230 | | 230 | | |
| 1961 | 172 | | 172 | | |
| 1962 | 2,030 | 7 | 2,023 | | |
| 1963 | 61 | | 61 | | |
| 1964 | 16 | | 16 | | |
| 1965 | 1,058 | 1 | 1,057 | | |
| 1966 | 1,450 | | 1,450 | | |
| 1967 | 1,936 | | 1,936 | | |
| 1968 | 2,955 | 1 | 2,954 | | |
| 1969 | 3,186 | 10 | 3,176 | | |
| 1970 | 2,228 | 1 | 2,226 | 1 | |
| 1971 | 2,006 | 2 | 2,004 | | |
| 1972 | 3,850 | 4 | 3,846 | | |

TABLE 3-4 (Continued)

Lumber and Wood Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 51,476 | 5 | | | 51,471 |
| 1955 | 52,506 | 243 | 276 | | 51,987 |
| 1960 | 147,471 | 1,785 | 19,307 | | 126,379 |
| 1961 | 115,475 | 1,014 | 17,868 | 95,873 | 720 |
| 1962 | 139,605 | | 24,007 | 27 | 115,571 |
| 1963 | 156,639 | 240 | 41,286 | | 115,113 |
| 1964 | 240,829 | 227 | 58,472 | 11 | 182,119 |
| 1965 | 210,342 | 393 | 37,399 | | 172,550 |
| 1966 | 217,976 | 1,850 | 54,083 | | 162,043 |
| 1967 | 232,789 | 2,584 | 29,265 | 3,579 | 197,361 |
| 1968 | 284,920 | 450 | 36,122 | | 248,348 |
| 1969 | 263,855 | 2,699 | 48,409 | 5 | 212,742 |
| 1970 | 268,661 | 2,074 | 29,766 | | 236,821 |
| 1971 | 235,865 | 756 | 35,770 | | 199,339 |
| 1972 | 281,566 | 1,408 | 13,292 | | 266,866 |

Furniture and Fixtures

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1965 | 167 | 1 | 143 | 23 | |
| 1966 | 74 | 3 | 60 | 11 | |
| 1967 | 1,287 | 5 | 137 | 562 | 583 |
| 1968 | 3,291 | 8 | 308 | 1,525 | 1,450 |
| 1969 | 2,240 | 20 | 807 | 451 | 962 |
| 1970 | 2,181 | 4 | 820 | 737 | 620 |
| 1971 | 968 | 2 | 898 | 68 | |
| 1972 | 806 | | 806 | | |

TABLE 3-4 (Continued)

Paper, Pulp and Allied Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 16,137 | 6 | 13,453 | | 2,678 |
| 1955 | 19,268 | | 13,462 | | 5,806 |
| 1960 | 35,887 | 35 | 34,566 | | 1,286 |
| 1961 | 35,909 | 3 | 35,656 | | 250 |
| 1962 | 34,464 | | 33,517 | 738 | 209 |
| 1963 | 39,085 | 368 | 38,710 | 7 | |
| 1964 | 40,463 | 43 | 40,420 | | |
| 1965 | 33,523 | 303 | 33,213 | 7 | |
| 1966 | 46,764 | 116 | 46,641 | 6 | 1 |
| 1967 | 42,756 | 425 | 42,331 | | |
| 1968 | 39,405 | 2 | 39,391 | 12 | |
| 1969 | 40,442 | 9 | 40,421 | 12 | |
| 1970 | 43,131 | 15 | 43,105 | 11 | |
| 1971 | 34,787 | 137 | 34,650 | | |
| 1972 | 41,187 | 24 | 41,163 | | |

Printed Matter

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1965 | 9 | | 9 | | |
| 1966 | 3 | 1 | 2 | | |
| 1967 | 7 | 2 | 5 | | |
| 1968 | 62 | 34 | 28 | | |
| 1969 | 47 | 9 | 38 | | |
| 1970 | 18 | 4 | 14 | | |
| 1971 | 119 | 14 | 105 | | |
| 1972 | 31 | 4 | 27 | | |

TABLE 3-4 (Continued)

Chemicals and Allied Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 943 | 61 | 33 | | 849 |
| 1955 | 19,899 | 675 | 18,482 | | 742 |
| 1960 | 47,125 | 39,596 | 7,389 | 20 | 120 |
| 1961 | 25,172 | 7,698 | 8,812 | 5,343 | 3,319 |
| 1962 | 21,482 | 13,277 | 7,526 | 9 | 670 |
| 1963 | 198,005 | 192,569 | 5,421 | 4 | 11 |
| 1964 | 247,737 | 235,719 | 10,246 | 1 | 1,771 |
| 1965 | 273,672 | 268,338 | 5,312 | 13 | 9 |
| 1966 | 296,759 | 293,607 | 3,093 | 59 | |
| 1967 | 338,058 | 336,065 | 1,993 | | |
| 1968 | 355,279 | 349,830 | 5,449 | | |
| 1969 | 430,567 | 418,526 | 8,310 | | 3,731 |
| 1970 | 387,272 | 378,085 | 911 | 5,743 | 2,533 |
| 1971 | 357,177 | 356,429 | 748 | | |
| 1972 | 134,172 | 104,150 | 30,022 | | |

Petroleum and Coal Products Refined

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 895,793 | 59 | | 27,237 | 868,497 |
| 1955 | 1,439,790 | 229 | | | 1,439,561 |
| 1960 | 1,648,939 | 7,354 | 242,262 | 8,565 | 1,390,758 |
| 1961 | 1,582,787 | 185,636 | 257,428 | 375,535 | 764,188 |
| 1962 | 1,726,353 | 284 | 294,778 | 10,982 | 1,420,309 |
| 1963 | 1,024,292 | 3,799 | 137,377 | | 883,116 |
| 1964 | 568,800 | 4,536 | 125,569 | 4,479 | 434,216 |
| 1965 | 659,417 | 4,211 | 267,710 | 1,3011 | 374,485 |
| 1966 | 852,237 | 6,680 | 104,529 | 115,264 | 625,764 |
| 1967 | 602,654 | 4,752 | 63,098 | | 534,804 |
| 1968 | 476,032 | 2,925 | | 88 | 473,019 |
| 1969 | 544,407 | 3,357 | 36,880 | | 504,170 |
| 1970 | 646,214 | 2,546 | 18,019 | 4,912 | 620,737 |
| 1971 | 752,508 | 1,569 | 1,602 | | 749,337 |
| 1972 | 682,694 | 1,762 | 9,657 | | 671,275 |

TABLE 3-4 (Continued)

Rubber and Miscellaneous Plastic Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 48 | | | | 48 |
| 1955 | 83 | | 69 | | 14 |
| 1960 | 684 | 9 | 675 | | |
| 1961 | 848 | | 848 | | |
| 1962 | 2,736 | | 2,736 | | |
| 1963 | 1,677 | 49 | 1,628 | | |
| 1964 | 2,176 | 43 | 2,133 | | |
| 1965 | 1,022 | 113 | 902 | 7 | |
| 1966 | 1,123 | 150 | 970 | 3 | |
| 1967 | 1,626 | 118 | 1,499 | | 9 |
| 1968 | 2,301 | 167 | 2,132 | 2 | |
| 1969 | 2,419 | 188 | 2,227 | 4 | |
| 1970 | 2,215 | 275 | 1,938 | 2 | |
| 1971 | 1,711 | 109 | 1,602 | | |
| 1972 | 1,824 | 107 | 1,717 | | |

Leather and Leather Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 3 | | | | 3 |
| 1955 | 6 | | | | 6 |
| 1960 | 103 | | 103 | | |
| 1961 | 411 | | 411 | | |
| 1962 | 367 | | 367 | | |
| 1963 | 438 | 1 | 437 | | |
| 1964 | 227 | | 227 | | |
| 1965 | 3,119 | | 3,119 | | |
| 1966 | 2,268 | | 2,268 | | |
| 1967 | 2,960 | | 2,960 | | |
| 1968 | 4,556 | 10 | 4,546 | | |
| 1969 | 3,992 | 11 | 3,981 | | |
| 1970 | 2,716 | | 2,716 | | |
| 1971 | 2,611 | | 2,611 | | |
| 1972 | 1,926 | 1 | 1,925 | | |

TABLE 3-4 (Continued)

Stone, Clay, Glass and Concrete Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 430 | | 197 | | 233 |
| 1955 | 7,093 | 152 | 6,763 | | 178 |
| 1960 | 7,693 | 6 | 7,650 | | 37 |
| 1961 | 4,402 | | 4,402 | | |
| 1962 | 4,634 | | 4,634 | | |
| 1963 | 5,937 | 127 | 5,810 | | |
| 1964 | 5,950 | 73 | 5,572 | 305 | |
| 1965 | 6,911 | 123 | 6,587 | 201 | |
| 1966 | 6,435 | 221 | 6,214 | | |
| 1967 | 9,241 | 807 | 8,434 | | |
| 1968 | 10,456 | 33 | 10,423 | | |
| 1969 | 11,192 | 114 | 11,078 | | |
| 1970 | 6,255 | 54 | 6,201 | | |
| 1971 | 3,794 | 50 | 3,744 | | |
| 1972 | 4,917 | 9 | 4,908 | | |

Primary Metal Products

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 10,202 | 7 | | | 10,195 |
| 1955 | 11,807 | 78 | 6,182 | | 5,547 |
| 1960 | 10,234 | 1,038 | 8,059 | 1 | 1,136 |
| 1961 | 4,046 | 250 | 3,790 | 6 | |
| 1962 | 6,472 | 158 | 6,256 | 58 | |
| 1963 | 23,856 | 467 | 23,389 | | |
| 1964 | 11,194 | 1,706 | 9,460 | 28 | |
| 1965 | 10,269 | 77 | 10,167 | 25 | |
| 1966 | 10,815 | 1,467 | 6,197 | | 3,151 |
| 1967 | 6,319 | 400 | 5,848 | 71 | |
| 1968 | 9,662 | 211 | 6,410 | 199 | 2,842 |
| 1969 | 10,552 | 493 | 4,292 | 10 | 5,757 |
| 1970 | 5,770 | 835 | 4,935 | | |
| 1971 | 6,026 | 840 | 5,186 | | |
| 1972 | 15,120 | 401 | 14,719 | | |

TABLE 3-4 (Continued)

Fabricated Metal Products,
Except Ordinance, Machinery and Transportation Equipment

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 2,577 | 38 | 10 | | 2,529 |
| 1955 | 4,553 | 233 | 1,867 | | 2,453 |
| 1960 | 3,265 | 89 | 2,999 | | 177 |
| 1961 | 2,636 | 28 | 2,608 | | |
| 1962 | 3,849 | 24 | 3,806 | | 19 |
| 1963 | 4,055 | 146 | 3,894 | 15 | |
| 1964 | 4,492 | 57 | 4,404 | 8 | 23 |
| 1965 | 4,562 | 600 | 3,938 | 13 | 11 |
| 1966 | 5,382 | 1,228 | 4,083 | 71 | |
| 1967 | 4,050 | 611 | 3,439 | | |
| 1968 | 4,024 | 549 | 3,475 | | |
| 1969 | 5,062 | 968 | 4,094 | | |
| 1970 | 6,489 | 350 | 6,139 | | |
| 1971 | 3,318 | 510 | 2,808 | | |
| 1972 | 3,380 | 287 | 3,093 | | |

Machinery, Except Electrical

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 641 | 138 | | | 503 |
| 1955 | 577 | 156 | 76 | | 345 |
| 1960 | 511 | 125 | 356 | 29 | 1 |
| 1961 | 210 | 98 | 112 | | |
| 1962 | 538 | 250 | 196 | 92 | |
| 1963 | 478 | 260 | 200 | 9 | 9 |
| 1964 | 533 | 197 | 246 | | 90 |
| 1965 | 866 | 368 | 239 | 191 | 68 |
| 1966 | 1,508 | 984 | 489 | 17 | 18 |
| 1967 | 7,229 | 572 | 670 | | 5,987 |
| 1968 | 1,584 | 1,040 | 522 | 22 | |
| 1969 | 2,354 | 834 | 1,073 | 447 | |
| 1970 | 1,424 | 822 | 583 | 19 | |
| 1971 | 2,086 | 1,505 | 581 | | |
| 1972 | 1,628 | 825 | 803 | | |

TABLE 3-4 (Continued)

Electrical Machinery and Equipment

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 988 | 3 | | | 985 |
| 1955 | 456 | 8 | 2 | | 446 |
| 1960 | 724 | 53 | 469 | | 202 |
| 1961 | 541 | 8 | 533 | | |
| 1962 | 899 | 10 | 837 | 52 | |
| 1963 | 898 | 47 | 847 | | 4 |
| 1964 | 1,372 | 17 | 1,331 | 4 | 20 |
| 1965 | 2,329 | 458 | 1,859 | 10 | 2 |
| 1966 | 2,498 | 481 | 2,013 | 4 | |
| 1967 | 3,174 | 168 | 3,006 | | |
| 1968 | 4,518 | 100 | 4,417 | 1 | |
| 1969 | 5,745 | 96 | 5,643 | 6 | |
| 1970 | 4,027 | 141 | 3,886 | | |
| 1971 | 5,924 | 63 | 5,861 | | |
| 1972 | 3,730 | 74 | 3,656 | | |

Transportation Equipment

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 200 | 96 | | | 104 |
| 1955 | 506 | 36 | 201 | 3 | 266 |
| 1960 | 1,109 | 54 | 412 | 105 | 538 |
| 1961 | 1,655 | 183 | 109 | 1,363 | |
| 1962 | 14,837 | 65 | 120 | 14,616 | 36 |
| 1963 | 1,390 | 115 | 318 | 787 | 170 |
| 1964 | 1,957 | 134 | 227 | 948 | 648 |
| 1965 | 1,613 | 82 | 130 | 963 | 438 |
| 1966 | 2,928 | 255 | 278 | 1,869 | 526 |
| 1967 | 3,673 | 154 | 231 | 2,422 | 866 |
| 1968 | 3,692 | 466 | 1,526 | 1,264 | 436 |
| 1969 | 848 | 266 | 403 | 3 | 176 |
| 1970 | 1,486 | 572 | 821 | | 93 |
| 1971 | 5,690 | 1,145 | 4,545 | | |
| 1972 | 1,260 | 279 | 981 | | |

TABLE 3-4 (Continued)

Instruments, Photographic and Optical Goods, Watches and Clocks

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1965 | 228 | 6 | 222 | | |
| 1966 | 220 | 4 | 216 | | |
| 1967 | 111 | 8 | 103 | | |
| 1968 | 296 | 4 | 292 | | |
| 1969 | 250 | 17 | 233 | | |
| 1970 | 201 | 3 | 198 | | |
| 1971 | 186 | 8 | 178 | | |
| 1972 | 99 | 2 | 97 | | |

Miscellaneous Products for Manufacture

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1965 | 102,567 | 102,558 | 9 | | |
| 1966 | 13,659 | 25 | 4,395 | 6,324 | 2,915 |
| 1967 | 5,447 | 3 | 5,335 | 62 | 47 |
| 1968 | 6,273 | 16 | 6,257 | | |
| 1969 | 5,444 | 23 | 5,421 | | |
| 1970 | 4,610 | 2 | 4,608 | | |
| 1971 | 3,313 | 5 | 3,308 | | |
| 1972 | 3,219 | 14 | 3,205 | | |

Waste and Scrap

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1955 | 21,526 | 21,526 | | | |
| 1960 | 703 | 703 | | | |
| 1961 | 10,913 | 10,113 | | 800 | |
| 1962 | 10,850 | 10,843 | | | 7 |
| 1963 | 45,079 | 45,079 | | | |
| 1964 | 67,461 | 67,459 | 2 | | |
| 1965 | 6,857 | 11 | 4,864 | 1,763 | 219 |
| 1966 | 80,255 | 80,255 | | | |
| 1967 | 85,104 | 85,097 | 7 | | |
| 1968 | 99,642 | 99,642 | | | |
| 1969 | 97,515 | 97,487 | 28 | | |
| 1970 | 157,922 | 157,919 | 3 | | |
| 1971 | 21,894 | 21,790 | 104 | | |
| 1972 | 100,193 | 100,193 | | | |

TABLE 3-4 (Continued)

Special Items

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 1,436 | 37 | | | |
| 1955 | 785 | 47 | 61 | 4 | 673 |
| 1960 | 3,251 | 962 | 1,864 | 114 | 311 |
| 1961 | 3,127 | 492 | 1,614 | 999 | 22 |
| 1962 | 5,302 | 196 | 2,800 | 2,225 | 81 |
| 1963 | 5,971 | 282 | 3,189 | 1,948 | 552 |
| 1964 | 6,859 | 67 | 3,150 | 2,999 | 643 |
| 1965 | 593 | | | 554 | 39 |
| 1966 | 1,066 | | | 545 | 521 |
| 1967 | 23,525 | 2 | 516 | 15,338 | 7,669 |
| 1968 | 11,714 | | 392 | 7,538 | 3,784 |
| 1969 | 1,819 | | 810 | 140 | 869 |
| 1970 | 715 | 4 | 570 | 56 | 85 |
| 1971 | 583 | 7 | 448 | 12 | 116 |
| 1972 | 752 | 1 | 751 | | |

DOD Controlled Cargo

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1955 | 23 | 23 | | | |
| 1960 | 314 | 314 | | | |
| 1961 | 8,430 | 8,430 | | | |
| 1962 | 122 | 122 | | | |
| 1963 | 40 | 40 | | | |
| 1964 | 97 | 97 | | | |
| 1965 | 77 | 77 | | | |
| 1966 | 311 | 311 | | | |
| 1967 | 1,118 | 1,118 | | | |
| 1968 | 124 | 124 | | | |
| 1969 | 1,643 | 1,643 | | | |
| 1970 | 5,602 | 5,602 | | | |
| 1971 | 5,107 | 5,107 | | | |
| 1972 | 4,766 | 4,766 | | | |

TABLE 3-4 (Continued)

TOTAL

| Year | Total | Foreign Exports | Foreign Imports | Coastwise Shipments | Coastwise Receipts |
|---|---|---|---|---|---|
| 1950 | 981,746 | 517 | 13,740 | 27,237 | 940,252 |
| 1955 | 1,660,073 | 93,468 | 55,880 | 26 | 1,510,699 |
| 1960 | 2,012,683 | 134,306 | 347,452 | 8,834 | 1,522,091 |
| 1961 | 3,387,546 | 322,565 | 1,737,631 | 497,216 | 830,134 |
| 1962 | 2,117,439 | 84,333 | 448,080 | 28,890 | 1,556,136 |
| 1963 | 4,105,340 | 374,019 | 2,060,089 | 6,623 | 1,664,609 |
| 1964 | 1,444,635 | 446,934 | 328,835 | 21,350 | 647,516 |
| 1965 | 1,508,467 | 518,238 | 419,806 | 6,887 | 553,536 |
| 1966 | 1,905,511 | 496,436 | 291,874 | 30,518 | 986,683 |
| 1967 | 1,590,971 | 539,337 | 243,473 | 22,061 | 786,100 |
| 1968 | 1,550,356 | 567,677 | 230,604 | 10,707 | 741,368 |
| 1969 | 1,619,525 | 599,314 | 272,449 | 1,083 | 746,679 |
| 1970 | 1,735,997 | 622,084 | 209,012 | 11,526 | 893,375 |
| 1971 | 1,631,628 | 488,173 | 171,308 | 80 | 972,067 |
| 1972 | 1,467,934 | 246,037 | 237,236 | --- | 984,661 |

b. Table 3-5 indicates general cargo handled across U.S. Naval facilities by the U. S. Navy or contract carriers for the 12-year period, from 1960 through 1971. Table 3-6 covers the same period for Navy petroleum controls.

TABLE 3-5

General Cargo Utilizing Naval Facilities*

| Fiscal year | Inbound (tons)** | Outbound (tons)** |
|---|---|---|
| 1960 | 59,838 | 69,935 |
| 1961 | 65,815 | 70,140 |
| 1962 | 48,229 | 80,576 |
| 1963 | 62,037 | 77,893 |
| 1964 | 47,864 | 65,845 |
| 1965 | 78,621 | 108,111 |
| 1966 | 125,890 | 159,050 |
| 1967 | 103,529 | 171,699 |
| 1968 | 77,201 | 280,563 |
| 1969 | 96,668 | 298,675 |
| 1970 | 93,367 | 245,999 |
| 1971 | 38,681 | 94,231 |
| 1972 | 22,693 | 131,931 |
| Total | 859,059 | 1,628,486 |

* Source: U.S. 11th Naval District.

**Tonnages include both private and Government owned vehicles, tanks, boats, aircraft engines, general stores. Tons are measured tons.

TABLE 3-6

Petroleum Products Handled Over Navy Piers, San Diego, California*

| Fiscal Year | Barrels | Tons @ 7 bbls/ton |
|---|---|---|
| 1960 | 4,311,029 | 616,000 |
| 1961 | 4,319,203 | 617,000 |
| 1962 | 4,500,018 | 643,000 |
| 1963 | 3,214,092 | 460,000 |
| 1964 | 10,125,000 | 1,446,500 |
| 1965 | 10,800,000 | 1,542,900 |
| 1966 | 10,504,000 | 1,500,600 |
| 1967 | 11,124,000 | 1,598,100 |
| 1968 | 10,954,000 | 1,564,900 |
| 1969 | 11,558,000 | 1,651,100 |
| 1970 | 8,986,000 | 1,283,700 |
| 1971 | 4,586,184 | 655,159 |
| Total | 90,395,342 | 12,914,800 |

* Source U.S. 11th Naval District
Note: 1972 figures were not available

## PROSPECTIVE COMMERCE

16. POTENTIAL IMPORT DEMAND. About two-thirds of the shipments received in the Port of San Diego are cargoes that are directly related to consumer use in the commercial tributary area. As the population gather enough per capita income to more than satisfy their basic needs, they begin to demand various additional consumption goods. When the income rises, the demand for these goods also rises (not necessarily at the same rate for all goods) and, in fact, rises faster than overall per capita income growth.

17. POTENTIAL IMPORTS. Two general methods of handling import projections were used – one for general cargo-other and one for major commodities. Pertinent information on these methods is given in the following subparagraphs.

a. General Cargo-Other. Historical foreign general cargo-other imports into the Port of San Diego have shown strong growth over the twenty-two year period 1950 to 1972, increasing approximately 850 percent (See table 3-7). Thus, the projected increase of about 1300 percent in the forty year period 1970 to 2010 (table 3-7A) based upon historical trends in the tributary area and national indices is conservative and well within the limits established by the historical trends. Coastwise general cargo-other imports into San Diego

have declined since 1966, vanishing entirely in 1972. The reason for this decline are not entirely understood although it is possible that recent increases in labor costs have made the cargo handling costs for transportation mode changes prohibitively expensive for short hauls. In any case, no future coastwise general cargo was projected for San Diego Harbor.

b. Projections of general cargo encompassed an average of imports for the years 1966-1971 which were used as a base for a growth index which included projections of population, personal income and imports per personal income dollar. Pertinent information on the factors reflected in development of the growth index is given in table 3-7A and pertinent information on the basis for that index is given in the following subparagraphs.

TABLE 3-7

Historical Foreign General Cargo – Other Imports
San Diego, California

| Year | Imports in Short Tons |
|---|---|
| 1950 | 14,961 |
| 1955 | 15,761 |
| 1960 | 28,344 |
| 1961 | 15,100 |
| 1962 | 57,119 |
| 1963 | 61,425 |
| 1964 | 59,110 |
| 1965 | 65,170 |
| 1966 | 76,600 |
| 1967 | 100,646 |
| 1968 | 137,885 |
| 1969 | 133,997 |
| 1970 | 111,687 |
| 1971 | 91,444 |
| 1972 | 126,936 |

Source: Waterborne commerce of the United States Part 4.

TABLE 3-7A

Development of Projected General Cargo - Other Imports
San Diego, California

| Year | Population In General area(1) | Personal Income in Tributary area (in thousands) of dollars(2) | Projected Average Propensity to Consume Imported Goods(3) | General Cargo - Other Consumption (short tons)(4) | Growth Index General Cargo - Other Consumption(5) | Projected Imports in Short Tons(6) |
|---|---|---|---|---|---|---|
| 1970 | 4,228,049 | 13,525,360 | .0425 | 574,828 | 1 | 105,000 |
| 1980 | 5,175,700 | 22,334,363 | .0544 | 1,214,989 | 2.114 | 222,000 |
| 1990 | 6,176,000 | 34,633,874 | .0669 | 2,317,006 | 4.031 | 424,000 |
| 2000 | 7,051,900 | 53,606,592 | .0795 | 4,261,724 | 7.410 | 778,500 |
| 2010 | 8,053,800 | 81,119,551 | .0920 | 7,462,999 | 12.983 | 1,365,000 |
| 2020 | 9,101,900 | 121,430,673 | .1045 | 7,462,000 | 12.983 | 1,365,000 |
| 2030 | 10,291,539 | 181,808,806 | .1170 | 7,462,000 | 12.983 | 1,365,000 |

(1) 1970 population from the U.S. Bureau of the Census. California population projections from State 1971. General Tributary area projections from OBERS.

(2) (1) X OBERS 1972 per capita income projections.

(3) Linear extrapolation of data from statistical abstract of U.S. 1972.

(4) (2) X (3) General Cargo Imports through the port of San Diego cannot increase after 2010 due to limited terminal facilities.

(5) (4)/574,828.

(6) (5) X 105,000. A 6-year (1966-1971) average was used because of large year to year variations.

NOTE: General cargo imports projections do not include coastwise general cargo. As shown in Graph 3-1, population and dollar projections reflect only data for the commercial tributary area in the United States. Other general cargo includes china, earthenware, toys, novelities, dry goods, canned goods, glass, frozen fish, frozen meat and miscellaneous items.

c. Estimates of population of the tributary area (omitting that part of Mexico within the area) were derived from projections published by the State of California Department of Finance and by OBERS.

d. Historic U.S. imports per personal income dollar were derived from statistics published by the U.S. Department of Commerce and by the United Nations (see bibliography). A regression curve was fitted to the historic imports per personal income dollar and extended to the year 2030. Projected imports per personal income dollar were then picked at 10-year intervals from this curve. The coefficient of correlation for this curve was 0.988. The growth of general cargo-other imports through San Diego Harbor was calculated by multiplying the tributary area's population at 10-year intervals by the propensity of the population to consume imported goods (4.25 cents per dollar of personal income in 1970). These products were then divided by the 1970 base year to determine the growth index of general cargo-other imports.

e. Major Commodities. Certain import commodities that cannot be completely classified as ultimate consumer goods have demand rates that vary significantly from the general cargo-other growth index described in preceding subparagraphs. Because these commodities have individual demand curves, the projections were handled separately. Among these commodities are molasses, petroleum products, lumber, iron and steel, plywood, and newsprint.

f. Future livestock-feed requirements were the basis for projections of molasses used as stock feed. Expected livestock production determined the amount of future livestock-feed requirements. Molasses is also used as binding for alfalfa pellets; therefore, the increase in pellet export was used as a basis for obtaining about 3 percent of the increase of molasses tonnage.

g. Lumber, steel and iron, newsprint, and plywood were projected from estimates of future requirements per capita for these commodities in the commercial tributary area.

h. Petroleum products were projected as a constant after 1975 due to the presence of a pipeline between Orange County and the City of San Diego, and uncertainty regarding both future use and future transportation methods of petroleum products.

18. The various projected imports for San Diego Harbor were summed, and the results are shown at 10-year intervals on a projected total-imports curve (see graph 3-2). Imports by 1980 are expected to reach 1,878,000 tons annually, as compared with an average of 1,091,000 tons for years 1966 through 1971.

19. GENERAL CARGO-OTHER. General cargo-other comprises china, earthenware, toys, novelties, dry goods, canned goods, glass, frozen fish, frozen meat, footwear and miscellaneous items.

20. MAJOR COMMODITIES. Pertinent information on imports of major commodities not included in general cargo-other is indicated in tables 3-8 and 3-8A and provided in the following subparagraphs:

a. Molasses. Molasses is a major import coming primarily from Hawaii and Mexico and shipped throughout the commercial tributary area. Newly constructed storage tanks in the harbor area are capable of storing a maximum of 3 million gallons. This greatly facilitates the movement of molasses. Imports of molasses are expected to continue at a fairly rapid rate, owing to its use in the livestock industry (feeding operations), which is constantly expanding in the tributary area. Moreover, the consumption of beef per capita is increasing and is expected to increase even more in future years.

TABLE 3-8

Projected Imports through San Diego Harbor
(short tons)

| Commodity | 1971* | 1980 | 1990 | 2000 | 2010 | 2020** | 2030** |
|---|---|---|---|---|---|---|---|
| Petroleum Products*** | 628,000 | 1,219,000 | 1,219,000 | 1,219,000 | 1,219,000 | 1,219,000 | 1,219,000 |
| Lumber | 210,000 | 242,000 | 274,000 | 303,000 | 335,000 | 372,000 | 412,000 |
| Plywood | 37,000 | 48,000 | 60,000 | 70,000 | 81,000 | 81,000 | 81,000 |
| Steel and Iron | 6,000 | 9,000 | 12,000 | 16,000 | 21,000 | 21,000 | 21,000 |
| Molasses | 65,000 | 85,000 | 102,000 | 123,000 | 146,000 | 176,000 | 213,000 |
| News Print | 40,000 | 53,000 | 67,000 | 81,000 | 98,000 | 98,000 | 98,000 |
| General Cargo - Other | 105,000 | 222,000 | 424,000 | 779,000 | 1,365,000 | 1,365,000 | 1,365,000 |
| Total | 1,091,000 | 1,878,000 | 2,158,000 | 2,591,000 | 3,265,000 | 3,332,000 | 3,409,000 |

* Imports indicated for 1971 represents an average for years 1966 through 1971, which was considered a more reliable base for projection purposes.

** Projections were held constant after 2010 because the capacity of terminal facilities would be reached at this time.

***San Diego Gas and Electric Company plans to substantially increase its use of fuel oil to generate electricity due to shortages of natural gas. The company is currently importing 138,800 tons of fuel oil which it anticipates will reach about 729,000 tons in 1975. The projections reflect a rapid increase in shipments to 1975 and then are held constant due to uncertainties regarding natural gas supplies, possibilities of alternate power operation methods and presence of pipelines.

TABLE 3-8A

Projected Imports Through San Diego Harbor
By Foreign and Domestic Movements, Vessel
Types, Design and Operating Drafts and
Commodities – For Recommended Project

| Type of Vessel and Major Item of Commerce – Design and Operating Drafts | Tonnage (1,000 tons) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
| Foreign Imports | | | | | | | |
| Tankers | | | | | | | |
| Design Draft | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| Operating Draft | 33 | 40 | 40 | 40 | 40 | 40 | 40 |
| Molasses* | 65 | 85 | 102 | 123 | 146 | 176 | 213 |
| Petroleum | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 65 | 85 | 102 | 123 | 146 | 176 | 213 |
| General Cargo Carriers | | | | | | | |
| Break Bulk | | | | | | | |
| Design Draft | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| Operating Draft | 33 | 34 | 34 | 34 | 34 | 34 | 34 |
| Iron and Steel Products | 6 | 9 | 9 | 9 | 9 | 9 | 9 |
| Newsprint | 40 | 53 | 53 | 53 | 53 | 53 | 53 |
| Plywood | 37 | 0 | 0 | 0 | 0 | 0 | 0 |
| General Cargo-other | 105 | 206 | 206 | 206 | 206 | 206 | 206 |
| Subtotal | 188 | 268 | 268 | 268 | 268 | 268 | 268 |
| Design Draft | 30 | 32 | 32 | 32 | 32 | 32 | 32 |
| Operating Draft | 30 | 32 | 32 | 32 | 32 | 32 | 32 |
| Containerized | 0 | 16 | 218 | 543 | 543 | 543 | 543 |
| Subtotal | 0 | 16 | 218 | 543 | 543 | 543 | 543 |
| Domestic Receipts | | | | | | | |
| Tankers** | | | | | | | |
| Design Draft | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| Operating Draft | 32 | 39 | 39 | 39 | 39 | 39 | 39 |
| Commodities | 620 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 |
| Subtotal | 620 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 |
| Total Imports and Receipts | 873 | 1,588 | 1,807 | 2,153 | 2,176 | 2,206 | 2,243 |

* Includes Hawaiian molasses.

** Based on Depth at 10th Avenue Marine Terminal.

NOTE: Domestic receipts of petroleum products are the only commodities projected in coastwise movements. Some petroleum products are foreign imports, however, they are refined and pumped by pipeline to San Diego. Future terminals or terminal's channel depths have not been determined, therefore, cargo destined for these terminals are not included.

b. Petroleum Products. Most of the imported petroleum products are gasoline and distillate oils. The immediate tributary area is served by a pipeline that transmits gasoline and distillate oils from Orange County to the City of San Diego. The pipeline company's long-range plans provide for additional pipelines when the demand warrants them. The only petroleum company that still ships its gasoline and distillate oils by tanker into San Diego is Standard Oil. Evidence points to continued use by this company of its tankers to carry not less than the present amount of gasoline and distillate oils. San Diego Gas and Electric Company is presently importing an average of 138,000 tons of fuel oil. The company plans to substantially increase its use of fuel oil to generate electricity due to shortages of natural gas. This fuel has a high viscosity and must be heated for pumping. It cannot be delivered effectively over long-distance pipelines. The company anticipates its imports by tankers to reach 729,000 tons by 1975. The projections reflect a rapid increase in shipments to 1975 and then are held constant due to uncertainties regarding natural gas supplies, possibilities of alternate power operation methods and presence of the pipelines.

c. Lumber. The Port of San Diego receives a small portion of the required lumber for the tributary area. The projection given in the U. S. Department of Agriculture Report on Timber Trends (see Bibliography) indicates that the per capita use of lumber will decrease. The total amount used will, however, increase due to the population increase. Most lumber received in San Diego at the present time is from the northwestern United States. In the future, some of the lumber will be imported from the Canadian Pacific area. The U. S. Forest Service feels that North American timber reserves, with proper management, will be adequate to meet the demands of the future.

d. Lumber projections were made by applying the population demand index to the present lumber shipments received in the Port of San Diego.

e. Iron and Steel. Imports of iron and steel products shipped from industrial areas of Asia (principally Japan) are becoming more common on the west coast. The modern steel industry of Asia is well able to compete in the domestic market for semi-finished and fabricated products. The projections of iron and steel imports were based on past trends and on per capita use studies by Resources for the Future, Inc. (Bibliography)

f. Plywood. Plywood is imported from Japan, the Philippines and Taiwan in an ever increasing amount each year through San Diego Harbor. The trend is likely to continue in future years. Use of plywood per capita is increasing and, according to the U. S. Forest Service (see bibliography), will continue to increase in the future. By 1990, it is estimated that per capita use will have increased by 30 percent over the present level. Owing to the lower labor rates in the Orient, logs are shipped to Asia for the making of plywood and veneer finishing, which are then shipped to the United States. The raw timber originates in the North Pacific States and Canada at present. Resources are available in the Pacific Basin to cover the future demand.

21. POTENTIAL EXPORT DEMAND. Large amounts of raw materials (including cotton, alfalfa pellets, potash, iron and other ores, and ferrous scrap) produced in the San Diego commercial tributary area are being exported through the Port of San Diego. These raw materials are in great demand in the Asian Pacific Basin countries (i.e., those Asian countries involved in trans-Pacific trade). The availability of these raw materials in the

commercial tributary area was examined and sufficient reserves were found to meet future demands for the next 50 years. Additional information on reserves of some raw materials is given under a subsequent paragraph heading "Major Commodities".

22. Shifts of cargo do occur among the ports, but this type of change cannot be predicted with certainty. Moreover, it is assumed that the Port of San Diego will exert all effort to at least maintain its present competitive standing among the Pacific Coast ports. This is indicated by the appointment within the last year of a Port marketing representative in Chicago. Under such assumptions, it can be stated that San Diego Harbor should, in the future, continue to receive its proportionate share of Pacific Coast world trade; that is, at least in a comparable ratio that the Port now holds. Based upon this premise, San Diego Harbor's share of this future market was determined by projecting most exports as increases in present shipments. As a result, the future tonnage shown is growth tonnage rather than commerce transferred from other harbors. Collected research on the Far East market (see bibliography) served as a primary foundation in developing potential raw material demands needed to sustain this future tonnage.

23. A study of the economic geography of the south and southeast Asian countries supplied an insight into those major activities that explain the differences in economic development. Relationships between the economic activities, such as agriculture, mining, and manufacturing, and the natural or physical environment of each country were determined and evaluated. Reflected in those relationships were the human and natural resources that are basic to the development of the country. In a few areas, many of these resources, such as tillable soil and coal and ore deposits, were found to be absent or insufficient in supply. As a result, the productive potential of a country would be hindered unless it elects to depend upon other nations for these resources.

24. The resource requirements of the various countries are basically the same - varying only in quantity demanded. These countries demand certain basic raw materials that are, as yet, unused, undiscovered, or in short supply in local areas. Raw material demand patterns were established for each country at rates based upon the direct and basic relationship between gross national product and imports of raw materials and the country's ability to develop industry and raw materials. To maintain the newly established and the expected industries, heavy inputs of raw materials are required - inputs that are well beyond the resources of the Asian Pacific Basin countries (excepting Japan).

25. The world's greatest population concentration is centered in Asia, which has a total land area of 10.5 million square miles and a population of slightly less than 2 billion (1969). The Asian population comprises approximately 56 percent of the world's total. The population-land relationship is particularly striking, especially in India and Japan. India, the second most populated country in the world, contains almost one-seventh of the world's population. Japan's population is approximately one-half that of the United States, though in area it is smaller than California.

26. Because of the unequal population distribution existing among the Asian countries, historic population was classified first by individual countries and secondly by geographic regions. Regional divisions of population are helpful in that they make prominent the

historic trends in population growth, various population distribution patterns, and current problems that arise from the population-land relationship. As a result of this geographic division, the production potential and future and present needs are more clearly evident. The critical imbalance that prevails between Asia's population and its food-producing capability is the prime cause of its social and economic problems. The regional divisions used were those used by the United Nations Department of Social and Economic Affairs (see bibliography). Population was projected to the year 2020.

27. The food consumption and production patterns of selected Asian countries were studied and analyzed to determine future food consumption. These patterns varied widely among regions, particularly where per capita income variations were great. In many of these countries, particularly in India, the per capita income is minimal. Food consumption was found to be low; and, as a result, diets were scarcely above the subsistence level. Even Japan, with its very high per acre agricultural yield, has a comparatively low per capita food production – indicating that country's dependence on imports for a major part of its food supply.

28. As population increases, the per capita land area of the Asian-Pacific Basin countries continues to diminish. Potentially higher yields are essential to overall development. A more intensive use of existing land, with increased fertilizer use, appears to be the most obvious means of expanding output to meet the demand of this increased population. Agricultural chemicals, such as potash, have no known sources in Asia. These Asian countries, realizing their dependence on such chemicals, must import them. The area tributary to San Diego is considered an ideal source of such chemicals.

29. Planned development programs that were initiated by the Asian-Pacific Basin countries during the postwar period, particularly those programs concerning development of the manufacturing sector of the economies and the domestic production of consumer goods, have created a greater dependence on raw material and capital goods. Consequently, imports of raw material and capital goods have increased and imports of consumer goods have decreased.

30. Detailed consideration was given to the past and present behavior of individual exports to Asia. Projections were developed based upon the following:

a. Forecasts of trends in GNP stated in United Nation's "Economic Bulletin for Asia and the Far East." (See bibliography).

b. Asia's growth rate derived from selected countries.

c. Projected changes and increases in physical facilities at the port which should result in more efficient handling of increased tonnage.

31. POTENTIAL EXPORTS. Four growth-index curves were prepared for use in making projections of raw-material exports to the Asian-Pacific Basin countries, i.e., raw-material import demands by those countries. The projections reflect a combination of past statistics and available information (tempered with experience in other areas) on future ideals and

needs of those countries to prevent economic collapse, famine, and the pursuit of false political ideologies in an attempt to effect an improved living standard.

32. Adequate information was available for the preparation of a curve for Japan and two other curves for Oceania, consisting of Australia and New Zealand, and representative underdeveloped countries – India, Taiwan and South Korea. A fourth curve was prepared for selected Asian-Pacific Basin Countries. These four curves are shown in graph 4, and pertinent information on the preparation and use of the curves is given in the following subparagraphs:

a. Japan. The advanced Japanese economy differs greatly from those of the other Asian countries. For this reason, Japan was treated separately. Japan's population in 1970 numbered 104 million, thereby placing Japan seventh in the world rank. In area, however, Japan contains only 142,726 square miles. In the years following World War II, Japan's population grew at an annual rate of 2 to 3 percent. The Japanese realized that this population rate must be curbed if significant growth in per capita income were to be obtained. Between 1965 and 1970, the annual rate of increase in population dropped to 1.0 percent.

b. The manufacturing sector of Japan's economic base is primarily responsible for its presently high stage of economic development. The agricultural sector plays a minor role in Japan, a situation in sharp contrast to the role played by the agricultural sector of all other Asian countries. In 1963, 31 percent of Japan's national income consisted of manufacturing; only 13 percent consisted of agriculture. For most of the other countries, the income derived from agriculture ranged from 40 to 50 percent of the total national income. Japan's consumption rate of raw materials far exceeds its production rate or yield. Though basic materials do exist on the islands, they are nowhere truly abundant. Moreover, there are basic items (including iron ore and potash) that have no known source in Japan. Japan is dependent on imports for these items.

c. Composite Groups. Two separate groups of countries were selected as being representative of other Asian countries. The first, Oceania, consists of Australia and New Zealand. The second, underdeveloped countries, consists of India, Taiwan and South Korea. Oceania is expected by the United Nations to have a growth rate slowly declining from the present annual rate of 6 percent per year. This rate of decline is expected to be slow enough to allow Oceania to enjoy a relatively high (4 percent plus) rate for a long period of time. The underdeveloped countries at present have a rather low rate of growth (3 percent) and are expected to continue this low rate for about 10 more years, at which point, their growth rates should escalate rapidly.

d. The statistics and other information used in projections for the five representative countries were extracted from United Nations sources (see bibliography) and are considered by the United Nations to be valid enough to be used for import-export projections. The statistics were studied for deviation from normal growth patterns, and such deviations were carefully analyzed to eliminate false or unusual economic pressures.

e. The United States aid programs (civilian) are reflected in the statistics on imports for the various Asian countries. In many cases, the aid that has been given these countries is necessary to prevent chaos. However, the over-all plan is that the aid will stimulate self-sustaining productivity in the future. As these countries develop the ability to produce goods that may be exchanged for dollars, the aid will slacken and eventually stop. Taiwan has already reached the first stage of the aid-slowdown process and, all aid – exclusive of military aid – will be phased out in the next few years. The stronger these respresentative countries become industrially and agriculturally, the larger the future market for United States goods and raw materials will be. Thus, the United States aid is not only short-term help but is an investment in Asian stability and future markets.

f. Total Asian-Pacific Basin Countries. The fourth developed growth curve represented the total Asian-Pacific Basin, taking into account the contrasting economies of industrialized Japan and the other countries in that basin. Although Japan is enjoying an advanced stage of self-sustaining growth, the other countries are emerging from a far less advanced stage and are embarking on an unexcelled rate of economic development.

33. The raw data was run on a computer to obtain a family of growth rates that best fits the historical data and the varying calculated amounts of raw material imports that will be required for the growth of the Asian countries. The various rates were then checked against projected future population figures to compare living standards that could reasonably be expected to change as the gross national product of these countries rises or decreases. After a thorough study of political and economic history of the Asian countries, growth rates were adopted that best typified the expected economic progress of these countries.

34. Several studies have been conducted on the correlation of gross national product to imports of capital goods, consumer goods, and raw materials. The most recent study was made by the United Nations Economic Committee for Asia and the Far East (ECAFE). The results of these studies identified a direct relationship between raw material imports and a nation's gross national product. Thus, the growth of the Asian countries and their raw material imports would be dependent on each other. The growth rates are not parallel because import rates in general will show greater growth than a nation's gross national product. The direct and basic relationship of gross national product to imports was used to project and determine the gross rate of raw material demand. The rate of growth was chosen to best reflect the country's ability to develop its industry and natural resources.

35. Total raw material exports expected through San Diego Harbor by 1980 are estimated at 1,000,000 tons compared to an average of 580,000 tons for the years 1966 through 1971. See tables 3-9 and 3-9A for more detailed information on project imports. Projections of selected raw material exports are shown on graphs 3-8 through 3-11 and the projection of total exports are shown on graphs 3-12.

36. MAJOR COMMODITIES. Pertinent information on major commodities is given in the following subparagraphs:

a. Cotton. Cotton has been a major export item through San Diego Harbor for the past 15 years. The tributary area for cotton includes west Texas, all of Arizona and New Mexico, the Imperial and Coachella Valleys of southern California, and the Mexican States

of Sonora and Baja California. The Orient, principally Japan, has been the chief buyer of U.S. cotton. Ninety percent of the U.S. cotton shipped through San Diego Harbor is destined for Japan; the remaining 10 percent goes to Europe. Importers and users of cotton in the Orient prefer the cotton grown in the southwestern United States, including California, over that grown in the southern States because of its finer quality. For this reason, cotton from the tributary area can demand a premium price.

b. Cotton has experienced serious trouble maintaining its place in world trade and consumption because of competitive synthetic fibers and the high price of U.S. cotton in the world market. The cotton industry has made remarkable strides, however, in its efforts to maintain a competitive position. Finer quality fibers and resin-coated fibers are the result of conscientious efforts on the part of the industry to recapture part of the market that was lost to synthetics. However, the recovery will be a slow and gradual process. Therefore, a continued, steady but slow growth of cotton exports through San Diego Harbor is forecast until approximately the year 2030, at which time a leveling might be expected as the Orient's cotton and synthetic fibers production improves.

c. Potash. Bulk potash shipments through the San Diego Harbor are becoming a sizeable export item increasing from 6,659 tons in 1959-60 to 80,229 tons in 1971-72. The average for 1966 through 1971 was 128,000 tons. Potash is mined in New Mexico and is exported through the harbor to most of the Asian-Pacific Basin countries. The projected estimate of shipments of potash from 1971 until 2030 is approximately 32 million tons. Strong evidence points to recoverable potash from thermal steam wells located in the Salton sink of Imperial County. The extent of these reserves is, as yet, undetermined. The presence of additional deposits in Utah-Colorado (425 million tons in shallow beds alone) and in Canada (6.4 billions tons) insures an ample supply for future export and domestic consumption. The export of these deposits are not projected through San Diego Harbor.

d. Other Agricultural Bulk. Included in this category are alfalfa pellets and hay. Export of alfalfa pellets increased from 13,693 tons in 1960 to 24,456 tons in 1971-72, the average for 1966 through 1971, however was 33,000 tons. In 1973 alfalfa pellet exports declined to approximately 1,500 tons, however, this is expected to be temporary. A continued increase is expected for future years, because much of the Asian-Pacific basin is deficient in livestock feeds and lacks proper soils and a favorable climate to grow alfalfa. Current and projected acreage in the tributary area for these commodities indicate the projections are reasonable.

TABLE 3-9

Projected Exports through San Diego Harbor
(in short tons)

| Commodity | 1971* | 1980 | 1990 | 2000 | 2010 | 2020** | 2030** |
|---|---|---|---|---|---|---|---|
| Phosphates | 4,000 | 8,000 | 12,000 | 18,000 | 22,000 | 22,000 | 22,000 |
| Scrap paper | 3,000 | 4,000 | 7,000 | 10,000 | 15,000 | 15,000 | 15,000 |
| Fertilizer | 181,000 | 315,000 | 493,000 | 724,000 | 902,000 | 902,000 | 902,000 |
| Potash | 128,000 | 224,000 | 349,000 | 514,000 | 640,000 | 640,000 | 640,000 |
| Scrap steel | 88,000 | 152,000 | 238,000 | 350,000 | 518,000 | 518,000 | 518,000 |
| Cotton | 23,000 | 29,000 | 35,000 | 42,000 | 51,000 | 51,000 | 51,000 |
| Soda ash | 41,000 | 72,000 | 112,000 | 165,000 | 206,000 | 206,000 | 206,000 |
| Fluorspar | 13,000 | 23,000 | 35,000 | 52,000 | 65,000 | 65,000 | 65,000 |
| Other agricultural bulk*** | 33,000 | 58,000 | 90,000 | 133,000 | 165,000 | 165,000 | 165,000 |
| General cargo | 66,000 | 115,000 | 180,000 | 264,000 | 391,000 | 391,000 | 391,000 |
| Total | 580,000 | 1,000,000 | 1,551,000 | 2,272,000 | 2,975,000 | 2,975,000 | 2,975,000 |

* Exports indicated for 1971 represent an average for years 1966 through 1971, which was considered a more reliable base for projection purposes.

** Projections were held constant after 2010 because the capacity of terminal facilities will be reached at this time.

***Includes alfalfa pellets and hay.

TABLE 3-9A

Projected Exports Through San Diego Harbor
By Foreign and Domestic Movements, Vessel
Types, Design and Operating Drafts and
Commodities – For Recommended Project

| Type of Vessel and Major Item of Commerce and Operating Drafts | Tonnage (1,000 tons) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
| Foreign Exports | | | | | | | |
| Bulk Carriers | | | | | | | |
| Design Draft | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| Operating Draft | 33 | 40 | 40 | 40 | 40 | 40 | 40 |
| Phosphates | 4 | 8 | 12 | 18 | 22 | 22 | 22 |
| Fertilizers | 181 | 315 | 493 | 724 | 902 | 902 | 902 |
| Potash | 128 | 224 | 349 | 514 | 640 | 640 | 640 |
| Scrap steel | 88 | 152 | 238 | 350 | 518 | 518 | 518 |
| Soda ash | 41 | 72 | 112 | 165 | 206 | 206 | 206 |
| Fluorspar | 13 | 23 | 35 | 52 | 65 | 65 | 65 |
| Other agricultural bulk* | 33 | 58 | 90 | 133 | 165 | 165 | 165 |
| Subtotal | 488 | 852 | 1,329 | 1,956 | 2,518 | 2,518 | 2,518 |
| General Cargo Carriers | | | | | | | |
| Break Bulk | | | | | | | |
| Design Draft | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| Operating Draft | 30 | 34 | 34 | 34 | 34 | 34 | 34 |
| Cotton and Linters | 23 | 29 | 29 | 29 | 29 | 29 | 29 |
| Scrap paper | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| General cargo-other | 66 | 99 | 99 | 99 | 90 | 99 | 99 |
| Subtotal | 92 | 132 | 132 | 132 | 132 | 132 | 132 |
| Containerized | | | | | | | |
| Design Draft | 30 | 32 | 32 | 32 | 32 | 32 | 32 |
| Operating Draft | 30 | 32 | 32 | 32 | 32 | 32 | 32 |
| Commodities | 0 | 16 | 81 | 157 | 157 | 157 | 157 |
| Total Exports and Shipments | 580 | 1,000 | 1,542 | 2,245 | 2,807 | 2,807 | 2,807 |

*Includes alfalfa pellets and hay.

NOTE: Future terminal or terminals channel depths have not been determined, therefore cargo destined for these terminals have not been included.

d. The Asian nations must import potash for use in manufacturing commercial fertilizers to grow more food for their ever-increasing populations. Use of potash in the United States is about 26 pounds per capita. The U.S. Department of Agriculture estimates that triple the amount of present fertilizers usage in the United States would be economically justified. This amount, compared with the low per capita use in Asia, e.g., approximately 0.2 lbs. in India, 14 lbs. in Japan, demonstrates the market requirement for potash.

e. The future is bright for an increase in potash shipments to the Orient because no known source of potash exists in the Pacific Basin. Potash deposits in Australia are undeveloped at this time. Pakistan and India realize the dire need for fertilizer mix to increase their food production and are investing millions of dollars in fertlizer plants.

f. Iron Ore Pellets and Copper Cement. In the survey report, 1.5 million tons of iron ore and 12 tons of copper cement by-product were forecast to be exported annually by 1980. This projection was based upon expected steel production requirements of Japan. Inasmuch as Japan has acquired mines in Australia during the last few years with sufficient capacity to meet anticipated requirements, no exports of these commodities are forecast.

g. Ferrous Scrap. Scrap iron and steel are basic materials for the steel industry. Projections for these sizeable exports are based on the raw material import growth rate for the Orient, primarily Japan. The United States is now and will continue to be a net exporter of ferrous scrap. Studies in "Resources in America's Future" indicate that over 60 percent of the total potential U.S. scrap will be available for export. The total supply will be adequate to meet the world requirements.

37. OTHER COMMODITIES. Other raw material export commodities include scrap paper, hides, and miscellaneous general cargo.

38. TRENDS. The general slowdown in the national economy was a major factor in reducing imports through Pacific Coast ports including the Port of San Diego. Despite this development, the port authority in their fiscal year 1969-70 report, emphasized that revenues are meeting debt service. The Port is obtaining its share of inbound cargo which is destined for the distant hinterland extending to the Atlantic Seaboard. This indicates its importance as a seaport of national significance. It is expected that trade with Mexico will increase partially as a result of the formation of the Mexican Foreign Trade Institute in December of 1970. Through the efforts of the Institute, some cargo has been moving through San Diego into Mexico and then exported to foreign countries. Mexico is exerting new pressures for greater exports. Port officials are also anticipating more trade with West Coast ports of South America. Exports of fertilizers, fluorspar, soda ash and copper concentrates have increased in recent years and are projected to grow considerably by 2030.

39. The lighter aboard ship vessel "Thomas Cuffe" of the Pacific Far East Line made its first stop in San Diego Harbor in March 1972 and discharged its lighters at the 10th Avenue Terminal. Lighters (floating containers) increase the speed of handling cargoes and cut voyage turnaround time – two factors which will cause the lighter-aboard-ship system to become increasingly significant in the shipping industry and port operations.

40. Low sulphur fuels for pollution control and expected increase of petroleum in heavy fractions imported by San Diego Gas and Electric Company tankers are expected to become the most significant portion of total petroleum imports. The little import and export of natural gas by tanker is forecast to remain relatively the same. San Diego Gas and Electric Company is importing natural gas by pipeline and trucks. They liquify the gas for vehicle use, which use is projected to increase. They are planning to build a liquified natural gas facility.

41. It is expected that wheat will be imported from Oregon and Washington for cattle feed grain needs in Imperial County. Although significant tonnage is brought in by rail from the midwest, a deficit exists. Projections of imports do not include wheat due to negligible wheat tonnage imports in the last five fiscal years (none in fiscal year 1969-70).

42. In 1972, San Diego Harbor received dry bulk imports for the first time. These imports consisted of phosphate rock from Spanish Sahara, nitrate fertilizer from Norway, and ferromanganese from France, South Africa and the Orient. Because these imports have existed for so short a time, they were not projected as separate items. Officials of the San Diego Unified Port District have stated that the containerized cargo crane, which was recently installed, may bring new commodities to the harbor. No attempt was made to forecast the quantity or nature of these new commodities.

43. In summary, many factors indicate that the Port of San Diego should be of major significance in international trade, especially with growing Asiatic markets.

## SUMMARY OF FINDINGS

44. The following tables (tables 3-10 and 3-11) summarizes total commerce through San Diego Harbor in 10-year intervals for the period 1971 to 2030.

TABLE 3-10

Present and projected volume of total commerce (by type of cargo) through San Diego, California 1971-2030 - in 1,000 short tons

| Type of cargo | 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|---|---|---|
| Bulk | 553 | 937 | 1,431 | 2,079 | 2,664 | 2,694 | 2,731 |
| Other cargo | 490 | 722 | 1,059 | 1,565 | 2,357 | 2,394 | 2,434 |
| Petroleum | 628 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 |
| Total | 1,671 | 2,878 | 3,709 | 4,863 | 6,240 | 6,307 | 6,384 |

## TABLE 3-11

Present and projected volume of total commerce
(by foreign and domestic totals) through San Diego Harbor, California
1970-2030 - in 1,000 short tons

| Year | Foreign Imports | Exports | Domestic Receipts | Shipments | Total |
|---|---|---|---|---|---|
| 1971* | 170 | 488 | 972 | 80 | 1,710 |
| 1980 | 393 | 1,000 | 1,485 | 0 | 2,878 |
| 1990 | 636 | 1,551 | 1,522 | 0 | 3,709 |
| 2000 | 1,035 | 2,272 | 1,556 | 0 | 4,863 |
| 2010 | 1,565 | 2,975 | 1,700 | 0 | 6,240 |
| 2020 | 1,565 | 2,975 | 1,767 | 0 | 6,307 |
| 2030 | 1,565 | 2,975 | 1,844 | 0 | 6,384 |

*Actual tonnage derived from "Waterborne Commerce of the United States", differs from 1971 figures in tables 3-8 and 3-9 which represents an average for commerce in years 1966 through 1971.

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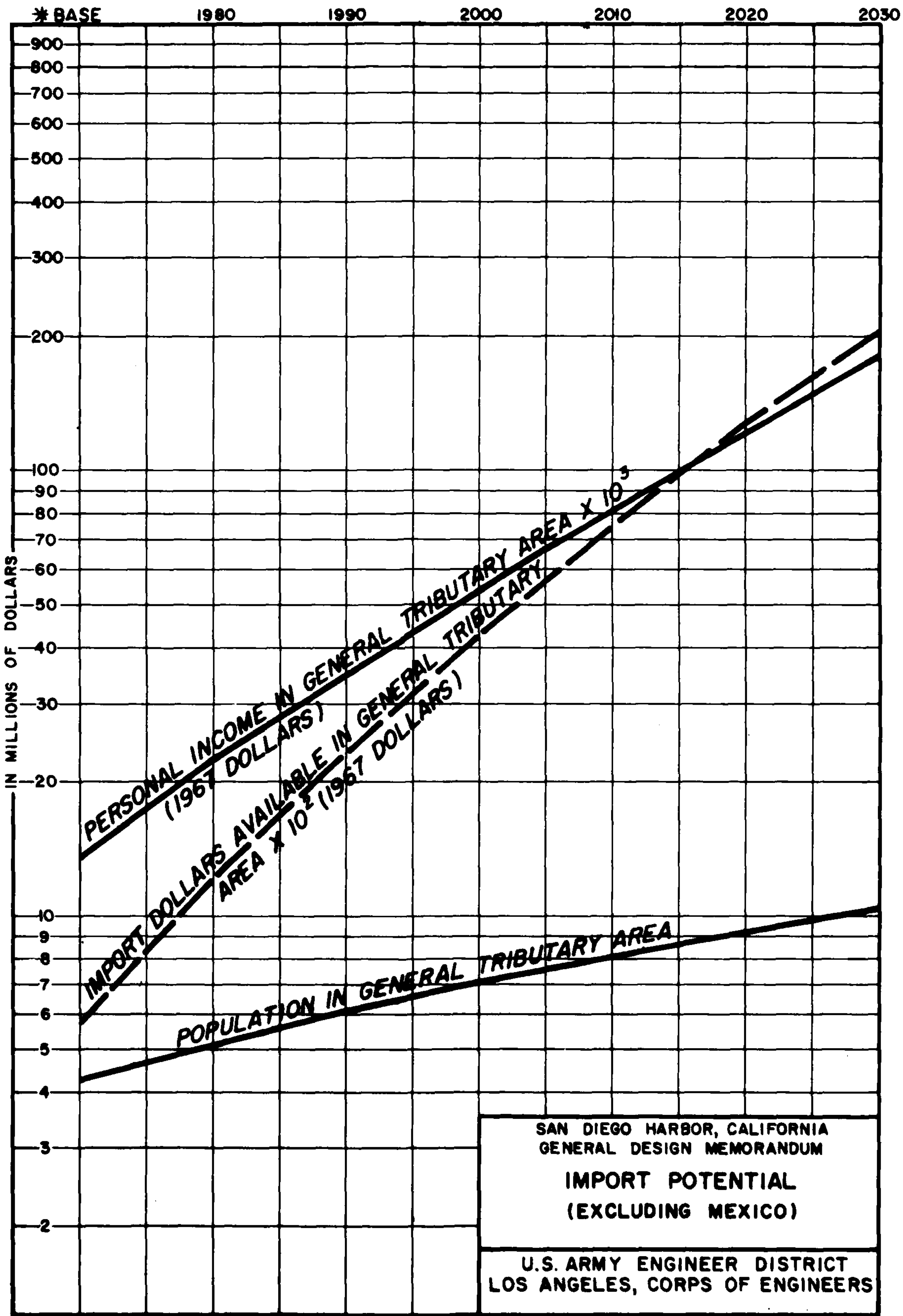


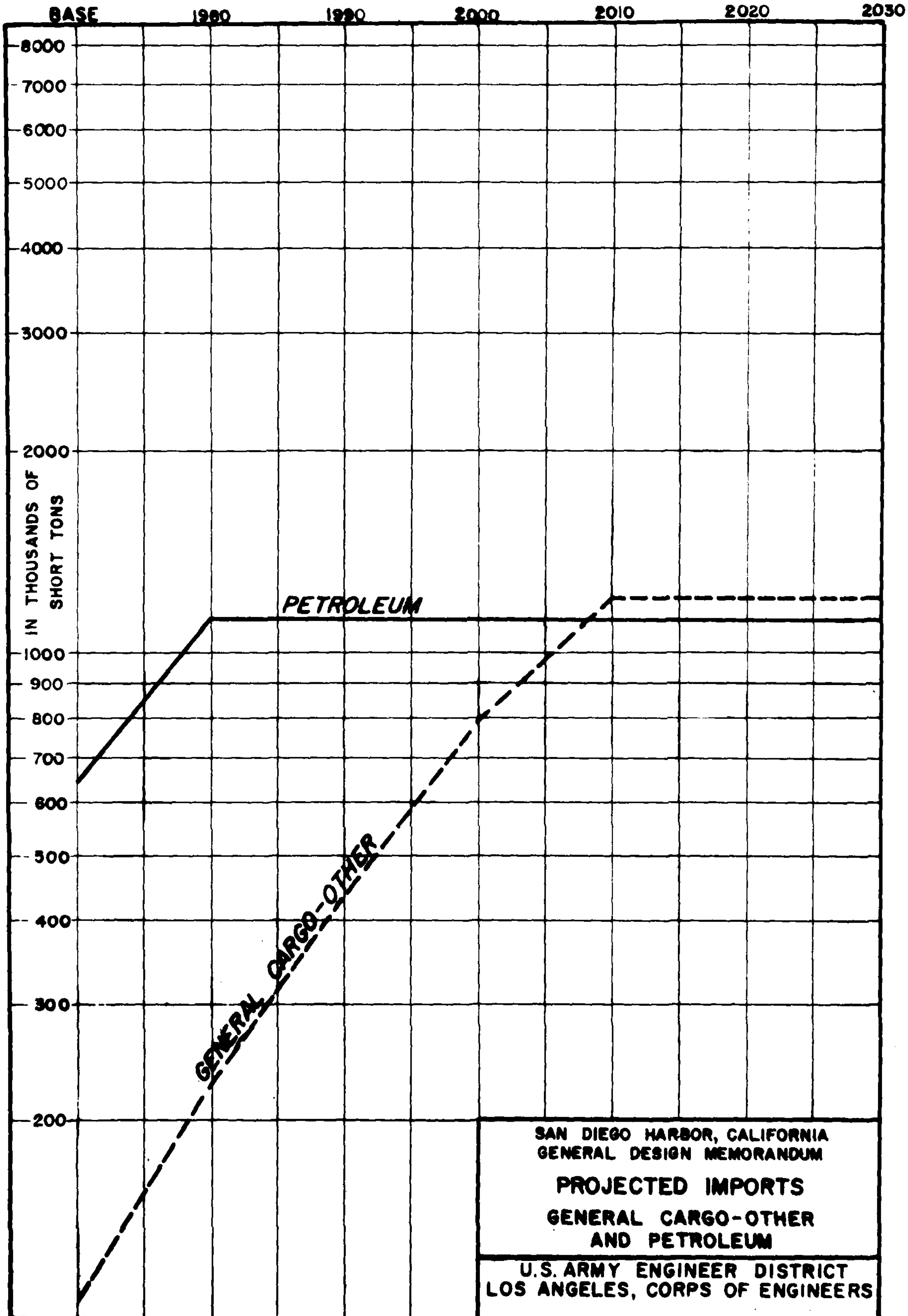

SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

**IMPORT POTENTIAL**
**(EXCLUDING MEXICO)**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

* AVERAGE FOR YEARS 1966 – 1971

APPENDIX 3 GRAPH 1



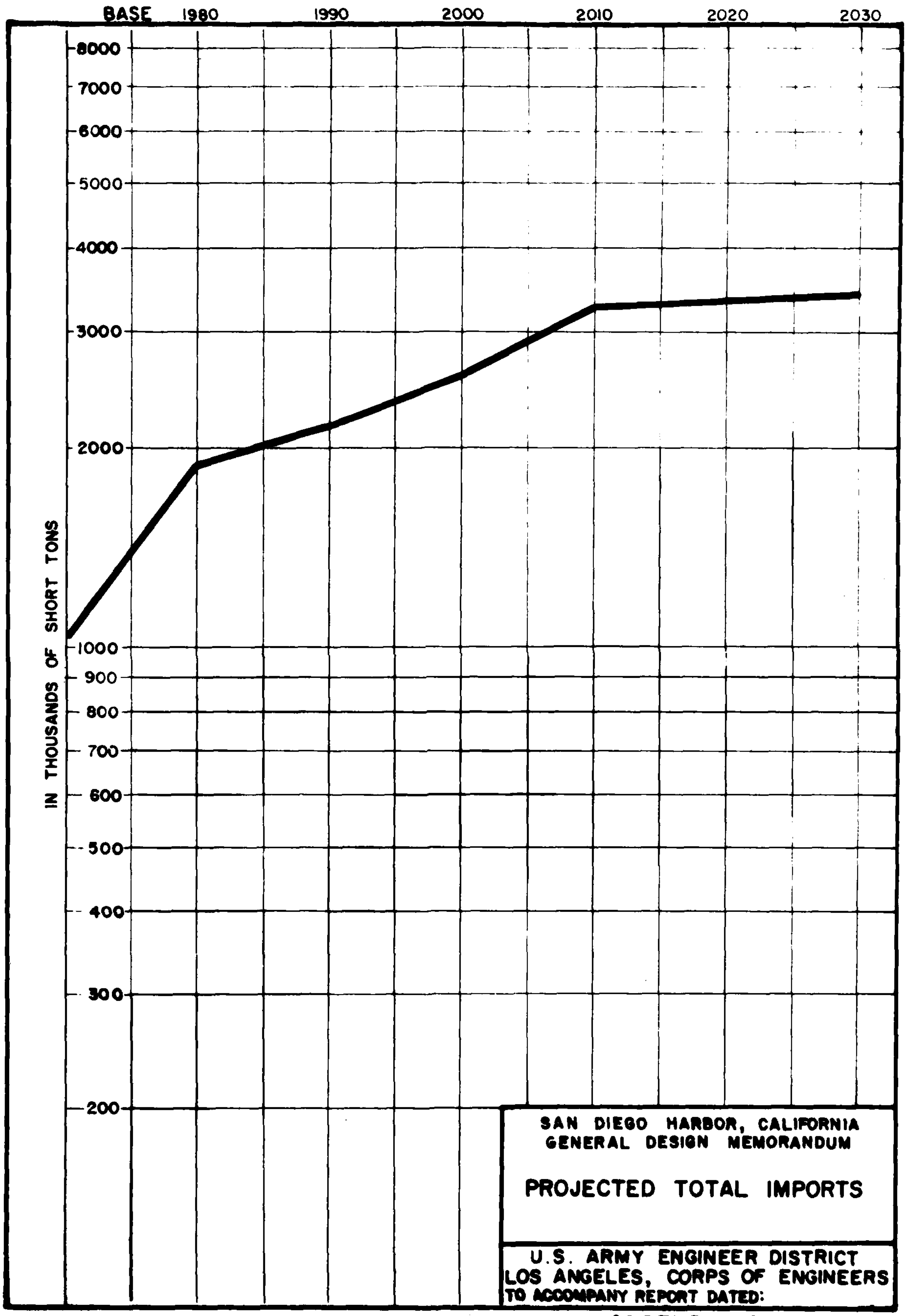

SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

PROJECTED IMPORTS

GENERAL CARGO-OTHER AND PETROLEUM

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

APPENDIX 3 GRAPH 2

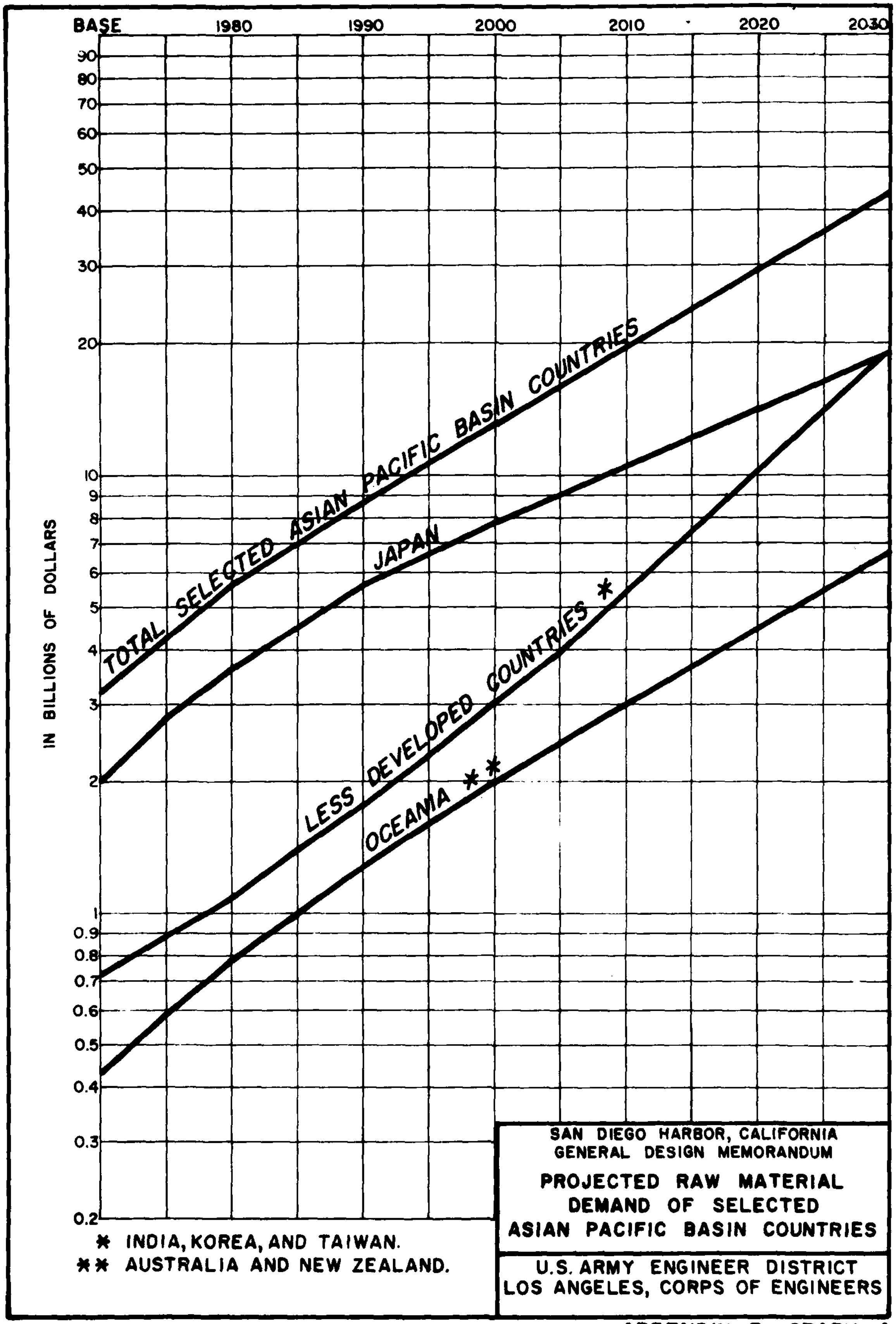



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

PROJECTED TOTAL IMPORTS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS
TO ACCOMPANY REPORT DATED:

APPENDIX 3 GRAPH 3

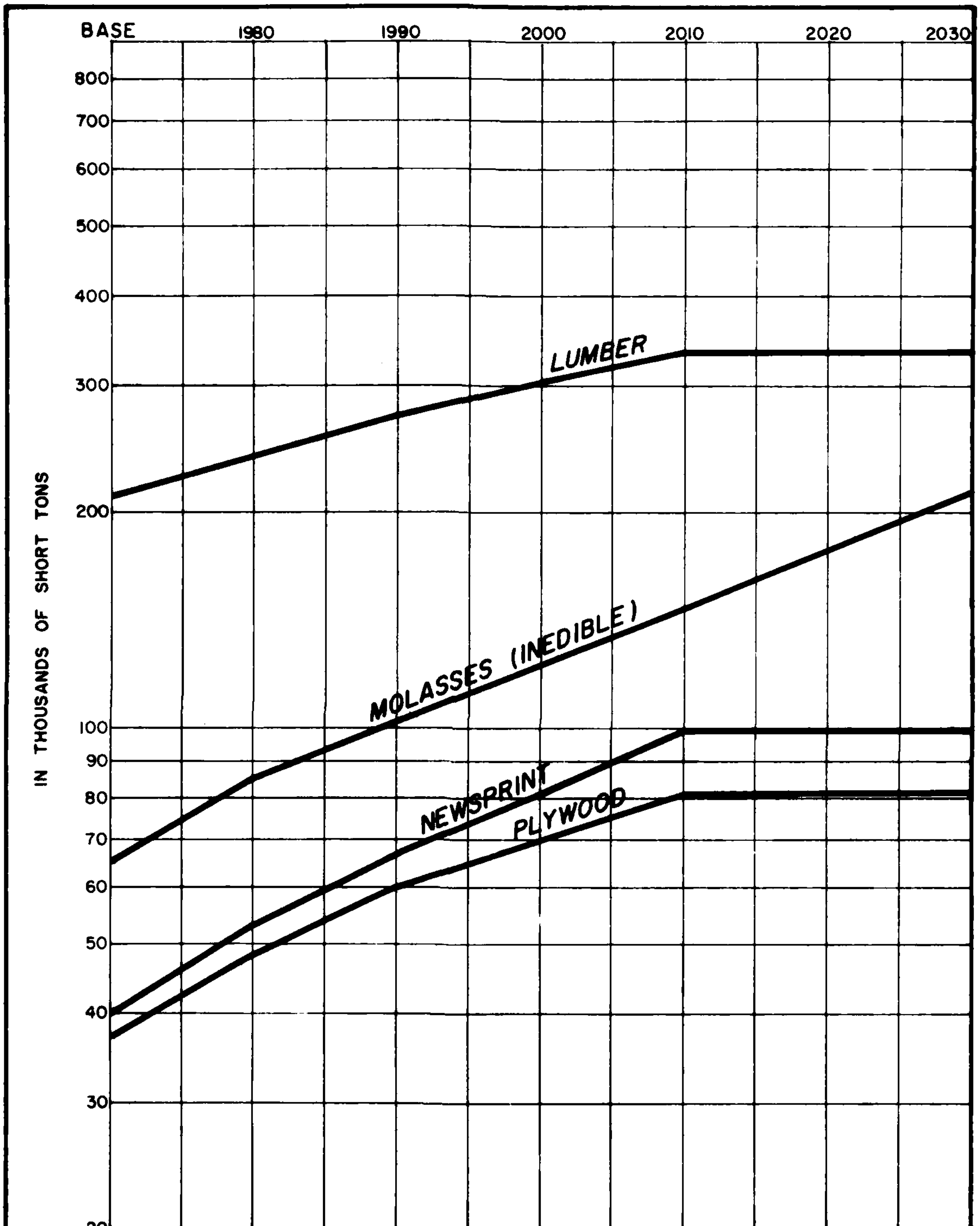



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

**PROJECTED RAW MATERIAL DEMAND OF SELECTED ASIAN PACIFIC BASIN COUNTRIES**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

**APPENDIX 3 GRAPH 4**

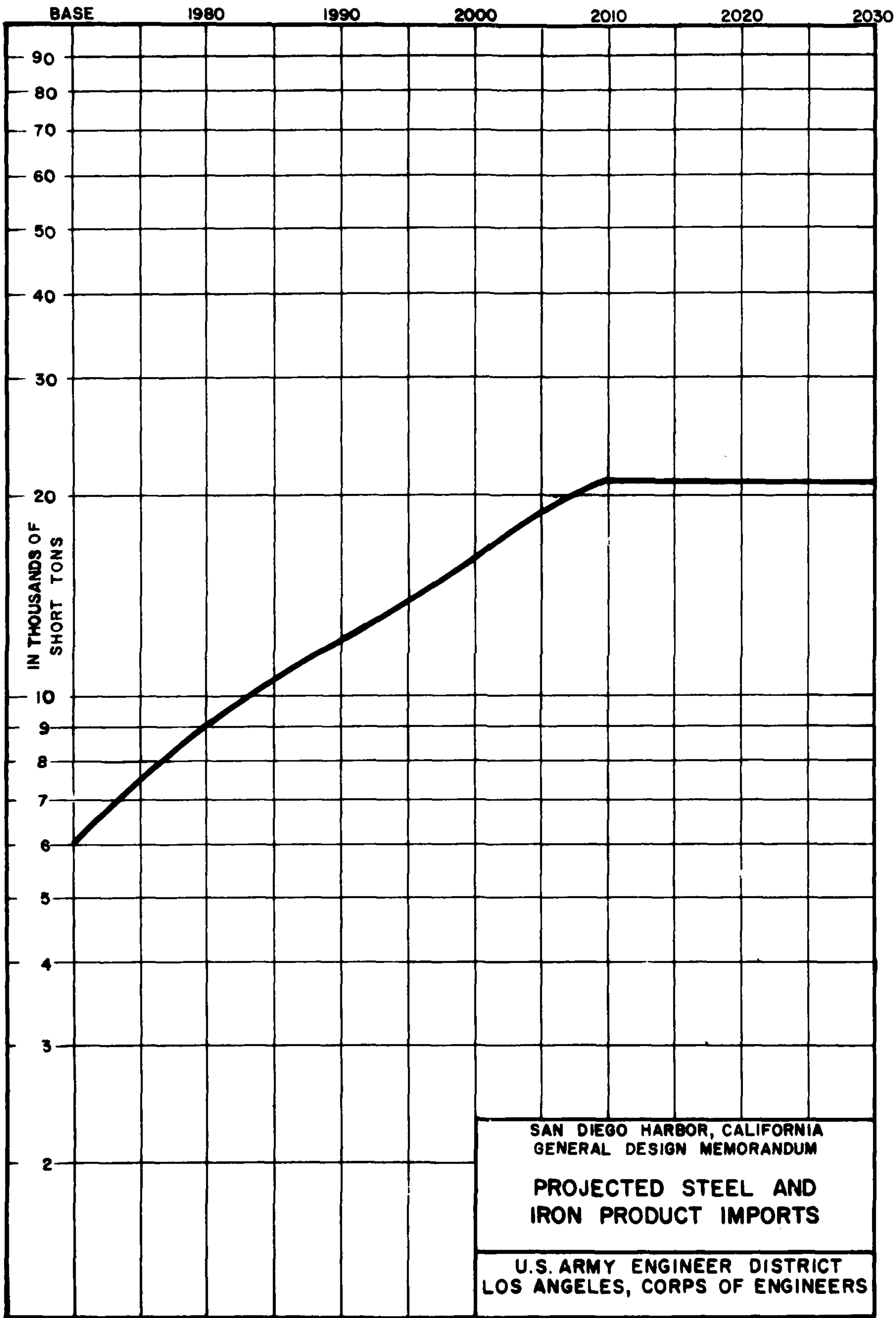



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

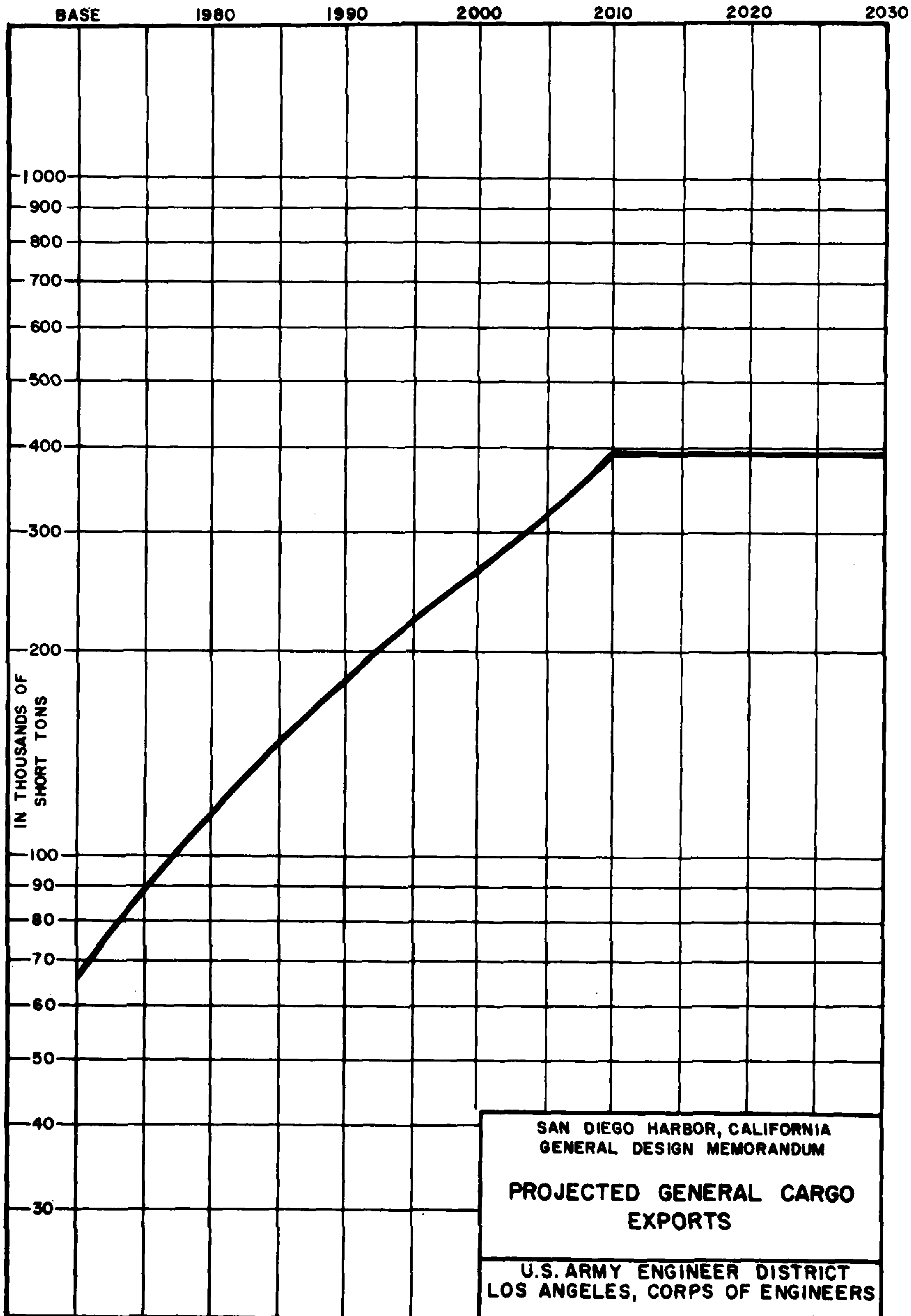
PROJECTED IMPORTS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

APPENDIX 3 GRAPH 5




APPENDIX 3 GRAPH 6

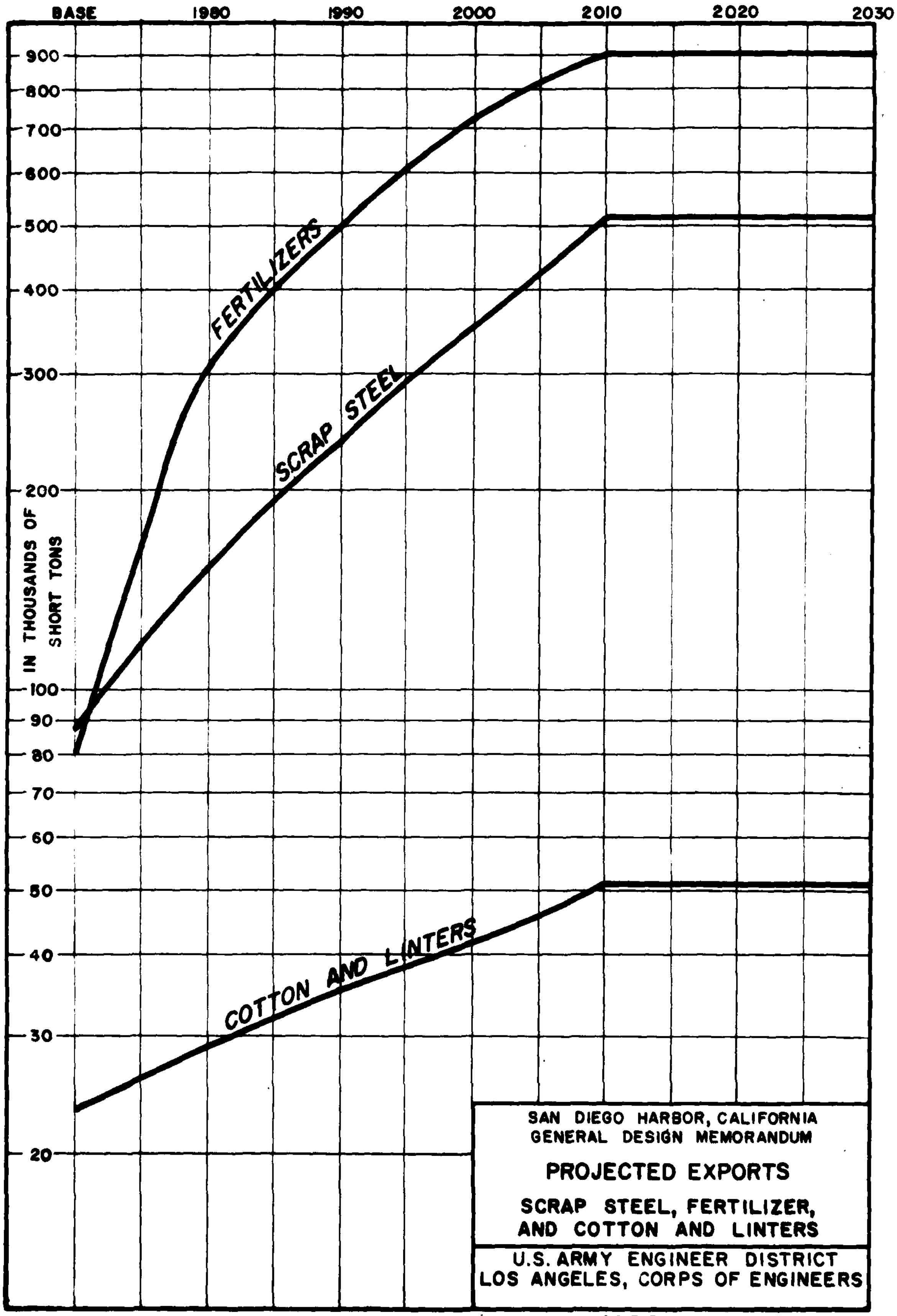



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

**PROJECTED GENERAL CARGO EXPORTS**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

APPENDIX 3 GRAPH 7

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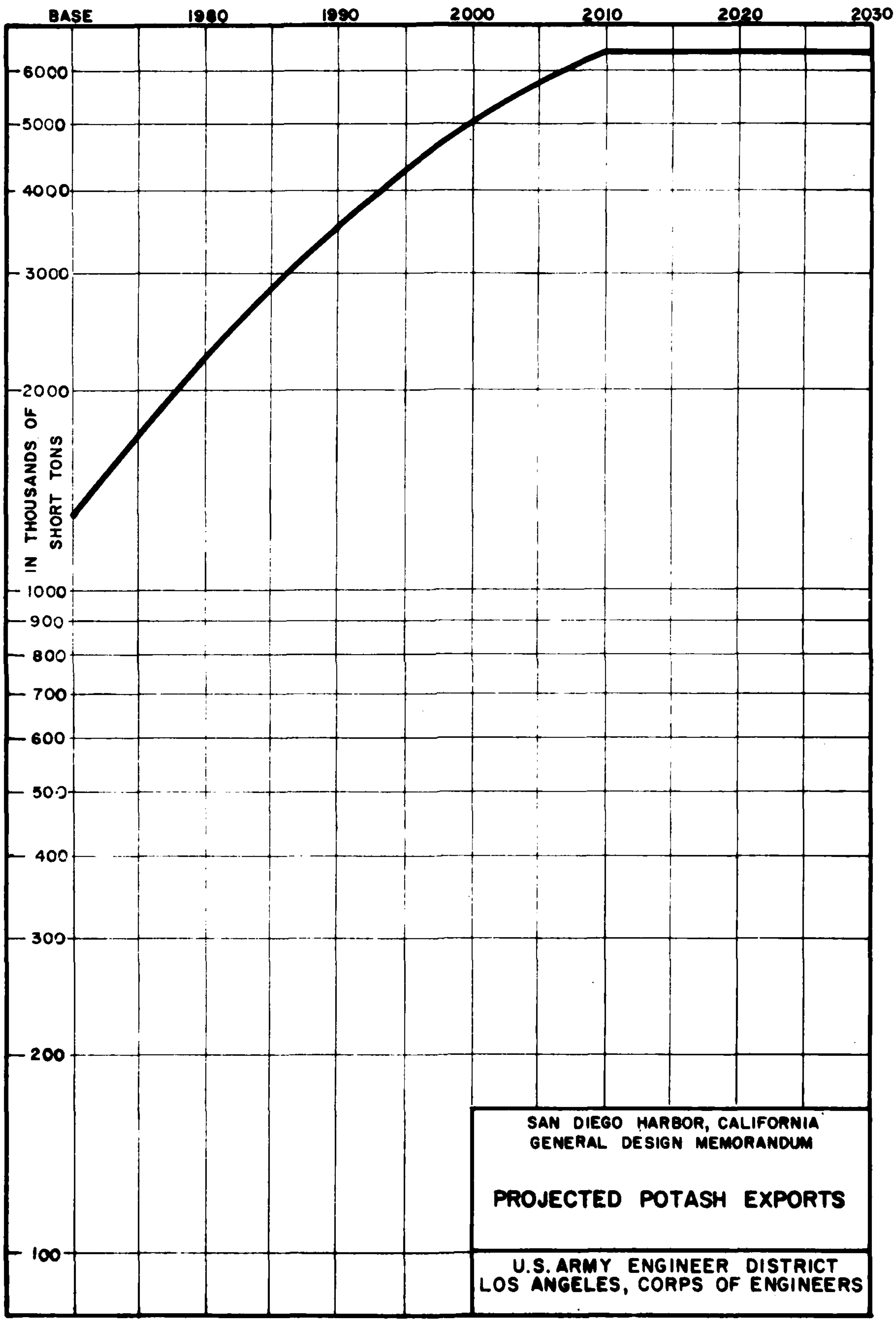


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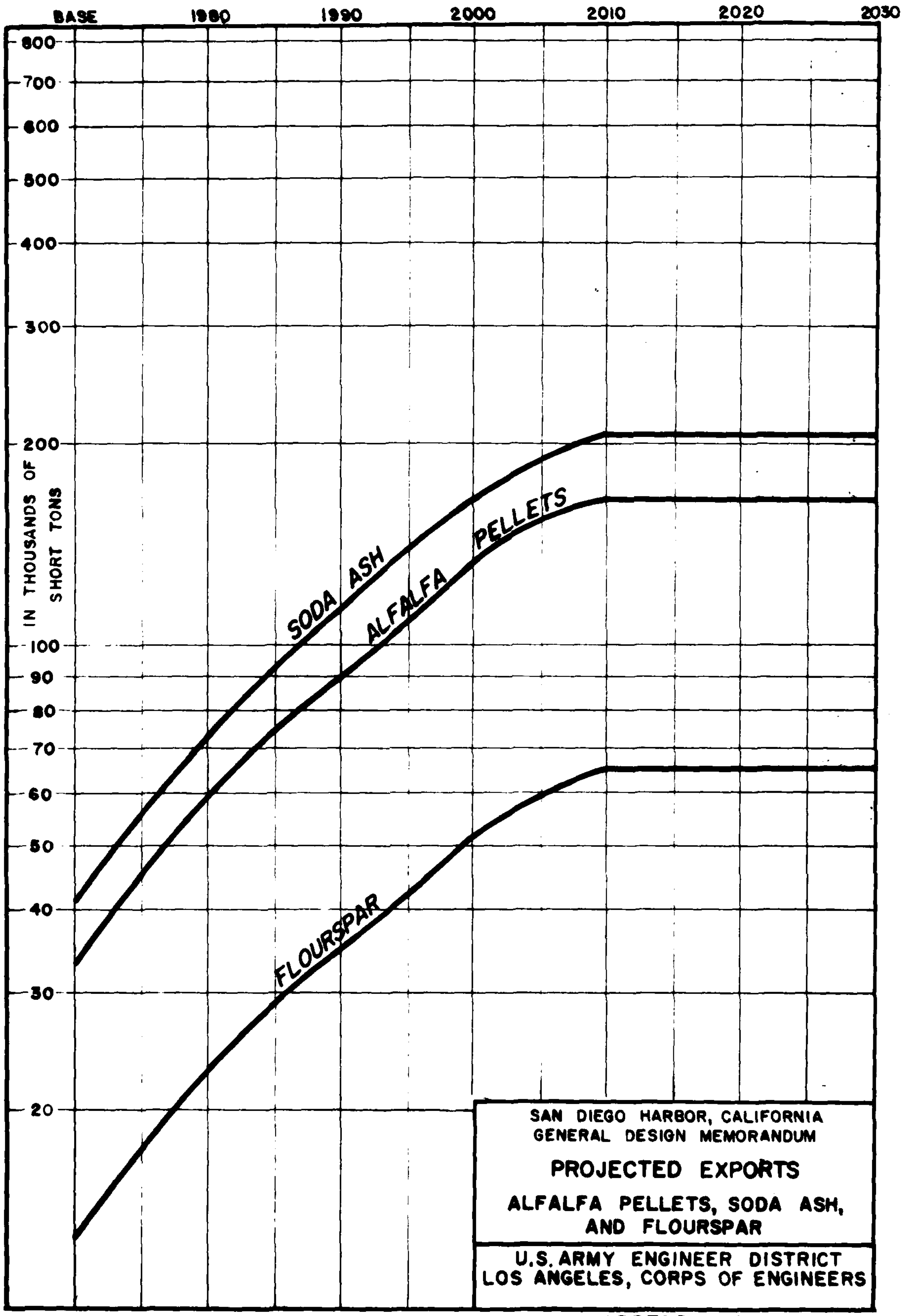


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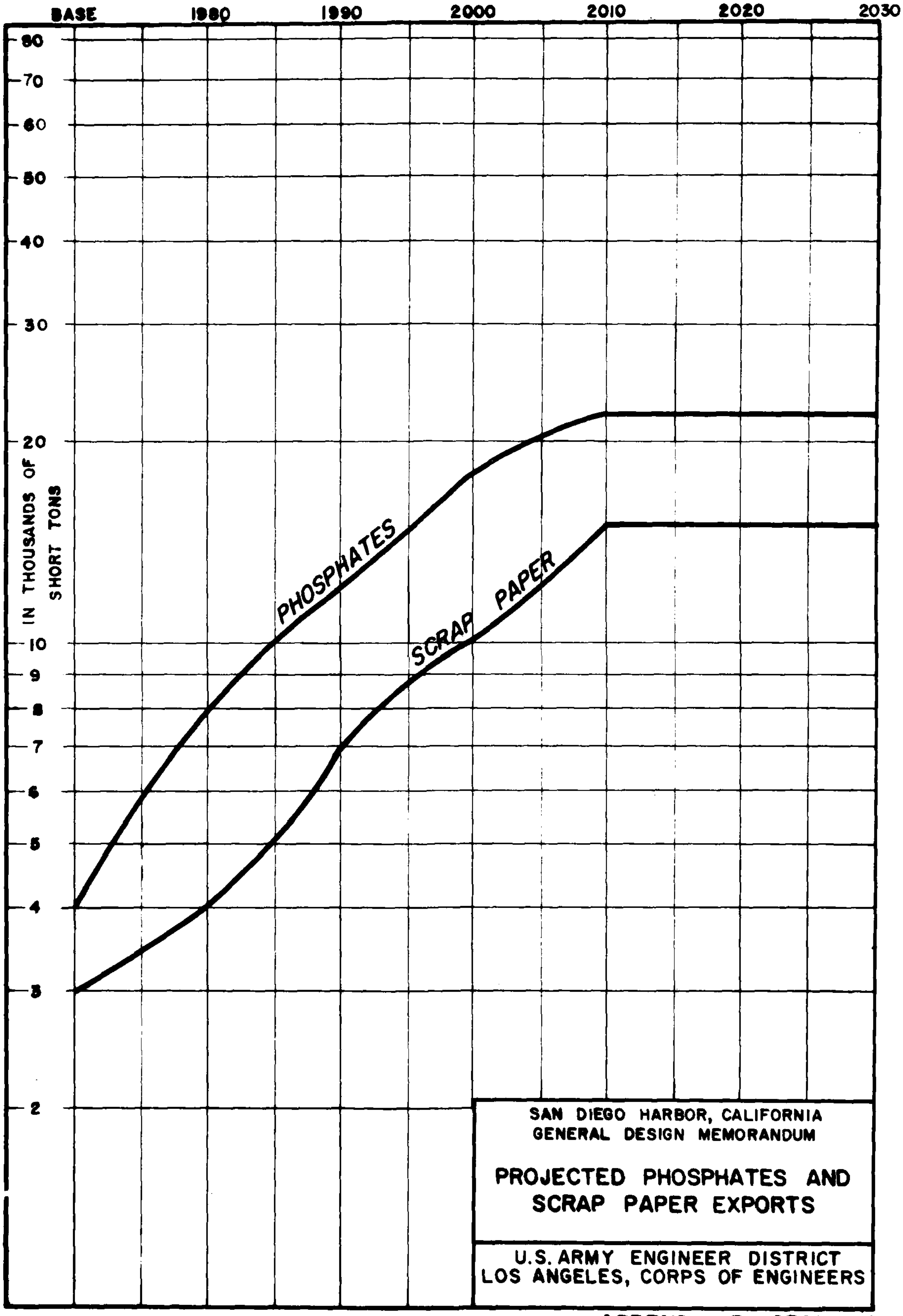
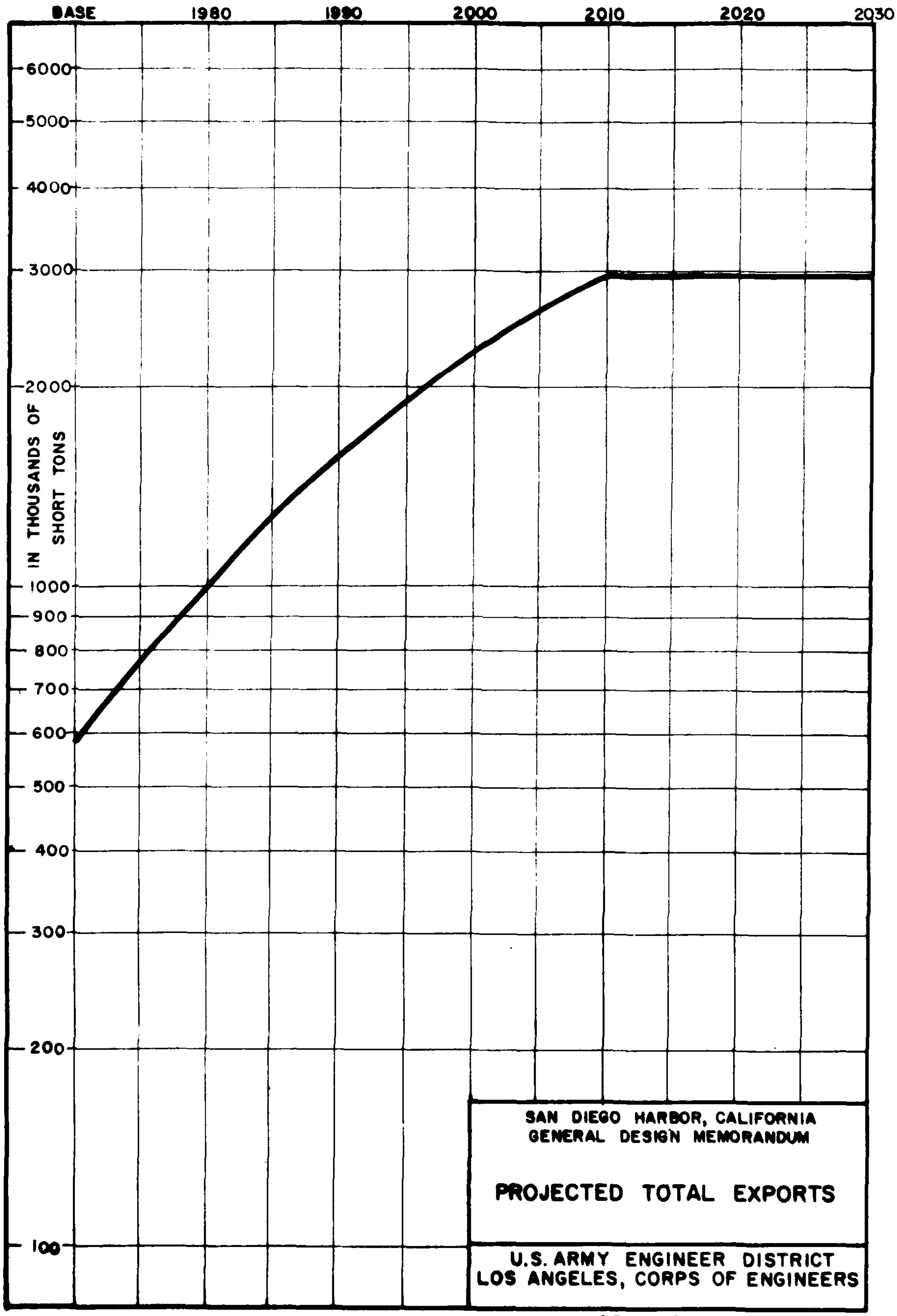



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

PROJECTED PHOSPHATES AND SCRAP PAPER EXPORTS

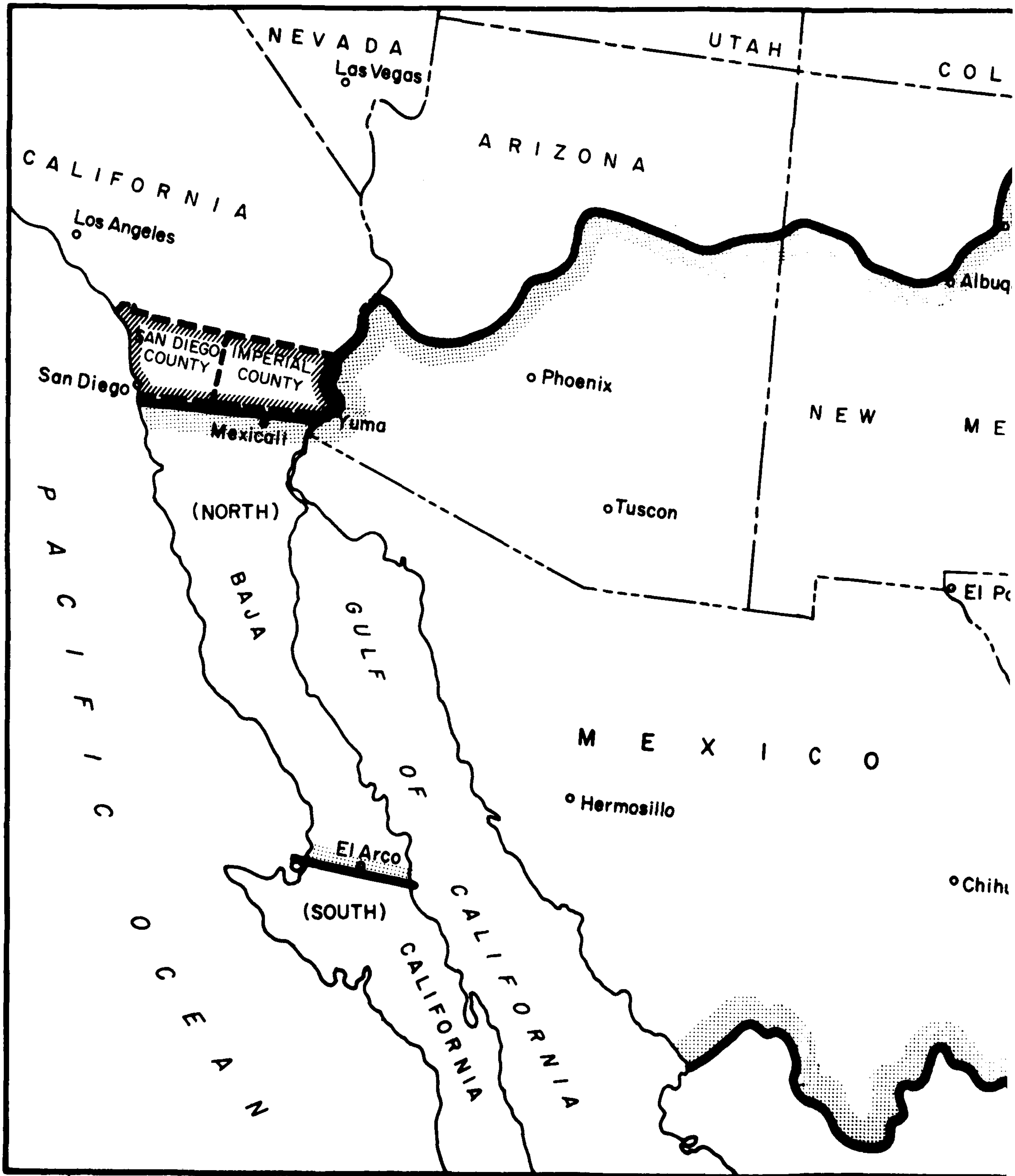
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

APPENDIX 3 GRAPH 11

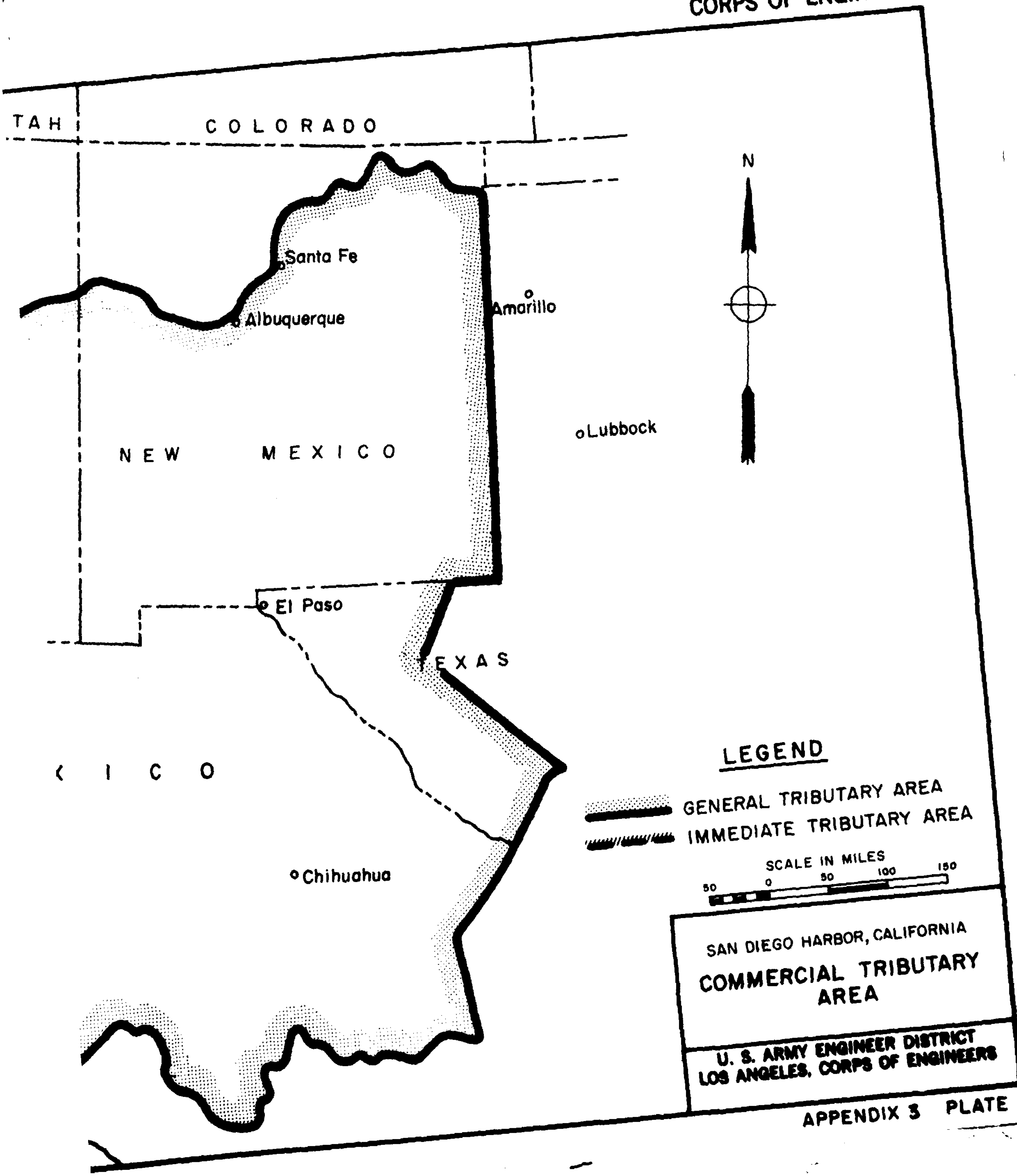



APPENDIX 3 GRAPH 12

U. S. ARMY ENGINEER DISTRICT



CORPS OF ENGINEERS




APPENDIX 3 PLATE I

APPENDIX 4

COMMERCE AND VESSEL TRAFFIC

SAN DIEGO HARBOR,
CALIFORNIA

## APPENDIX 4

## COMMERCE AND VESSEL TRAFFIC
## SAN DIEGO HARBOR, CALIFORNIA

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TABLES

## COMMERCE AND VESSEL TRAFFIC
## SAN DIEGO HARBOR, CALIFORNIA

1. SCOPE. An analysis of historical and existing vessel traffic has been made. Future carrying capacity of vessels is discussed and prospective commerce, and vessel traffic by type of vessel and cargo and terminal destination are indicated. Terminals and berths, both existing and projected, are tabulated in terms of break bulk and container (general cargo) and other uses. Future methods of handling and shipping general cargo are also discussed.

### EXISTING VESSEL TRAFFIC

2. TRIPS AND DRAFTS OF DRY-CARGO VESSELS IN SAN DIEGO HARBOR. Table 4-1 lists vessel trips by draft of dry-cargo vessels in San Diego Harbor for 1960 through 1970. The percent distribution of vessel traffic by draft is shown in table 4-2.

3. Information presented in table 4-1 was obtained from "Waterborne Commerce of the United States" for calendar years 1960 through 1970. The published statistics include all vessels that call at the harbor. This includes commercial fishing vessels and all other vessels that report to customs. Data in table 4-2 has been modified to reflect actual vessels calling for commercial purposes, as reported by the Unified Port District. It was assumed that the number of commercial carriers with drafts less than 23 feet would be the difference between the total number of vessel trips reported by the Unified Port District and the number of trips of vessels greater than 22 feet as reported in "Waterborne Commerce of the United States."*

*Part 4, Waterways and Harbors, Pacific Coast, Alaska and Hawaii, compiled under the supervision of the Division Engineer, U.S. Army Engineer Division, South Pacific, Corps of Engineers, San Francisco, California.

TABLE 4-1

Vessel Traffic by Draft Class, Dry Cargo and Passenger
Inbound and Outbound – San Diego Harbor, California*

| Draft class feet | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | Averages 64-70 | Percent Dist. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.02 |
| 36 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0.6 | 0.2 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0.6 | 0.2 |
| 34 | 0 | 0 | 2 | 1 | 1 | 0 | 3 | 0 | 2 | 3 | 1 | 1.4 | 0.4 |
| 33 | 1 | 0 | 0 | 2 | 0 | 1 | 4 | 1 | 4 | 5 | 2 | 2.4 | 0.6 |
| 32 | 0 | 0 | 1 | 2 | 1 | 3 | 1 | 4 | 7 | 2 | 3 | 3.0 | 0.8 |
| 31 | 8 | 1 | 2 | 12 | 5 | 6 | 13 | 8 | 3 | 10 | 12 | 8.1 | 2.2 |
| 30 | 9 | 14 | 12 | 17 | 8 | 21 | 8 | 24 | 13 | 22 | 26 | 17.4 | 4.7 |
| 29 | 41 | 31 | 19 | 20 | 13 | 27 | 17 | 20 | 17 | 21 | 34 | 21.3 | 5.7 |
| 28 | 52 | 46 | 29 | 43 | 26 | 32 | 21 | 26 | 30 | 29 | 48 | 30.3 | 8.2 |
| 27 | 62 | 75 | 51 | 51 | 32 | 38 | 32 | 38 | 53 | 41 | 47 | 40.1 | 10.8 |
| 26 | 69 | 52 | 52 | 54 | 50 | 47 | 49 | 48 | 71 | 33 | 49 | 49.6 | 13.4 |
| 25 | 48 | 38 | 80 | 47 | 69 | 56 | 53 | 53 | 75 | 69 | 70 | 63.6 | 17.2 |
| 24 | 47 | 50 | 66 | 59 | 68 | 42 | 74 | 69 | 80 | 82 | 69 | 69.1 | 18.7 |
| 23 | 42 | 75 | 78 | 55 | 60 | 58 | 74 | 64 | 66 | 68 | 88 | 62.3 | 16.8 |
| Subtotal | 379 | 382 | 392 | 363 | 334 | 333 | 351 | 357 | 421 | 387 | 449 | 369.9 | 100.0 |
| 22 and less | 2,267 | 2,353 | 2,421 | 1,417 | 2,288 | 2,354 | 2,306 | 2,153 | 2,474 | 2,599 | 2,493 | 25,125 | |
| Total | 2,646 | 2,735 | 2,813 | 1,780 | 2,622 | 2,687 | 2,657 | 2,510 | 2,895 | 2,986 | 2,942 | 29,273 | |

*As reported in "Waterborne Commerce of the United States." Does not include military vessels or commercial fishing craft that do not operate in foreign waters.

TABLE 4-2

Percent Distribution of Vessel Trips by Draft Class, Dry Cargo
1960-1970* – San Diego Harbor, California

YEAR AND PERCENT

| Draft class feet | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | Average Percent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.01 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.2 | 0 | 0 | 0 | 0 | 0.03 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0.2 | 0 | 0.04 |
| 34 | 0 | 0 | 0.1 | 0.1 | 0.2 | 0 | 0.4 | 0 | 0.2 | 0.3 | 0.1 | 0.12 |
| 33 | 0.1 | 0 | 0 | 0.2 | 0 | 0.1 | 0.5 | 0.1 | 0.5 | 0.5 | 0.2 | 0.2 |
| 32 | 0 | 0 | 0.1 | 0.2 | 0.1 | 0.4 | 0.1 | 0.5 | 0.8 | 0.2 | 0.3 | 0.2 |
| 31 | 0.9 | 0.1 | 0.1 | 1.1 | 0.6 | 0.7 | 1.5 | 1.0 | 0.3 | 1.0 | 1.2 | 0.8 |
| 30 | 1.0 | 1.3 | 0.9 | 1.6 | 1.0 | 2.6 | 0.9 | 2.9 | 1.5 | 2.0 | 2.7 | 1.7 |
| 29 | 4.5 | 2.9 | 1.5 | 1.8 | 1.6 | 3.2 | 2.0 | 2.4 | 1.9 | 2.0 | 3.5 | 2.5 |
| 28 | 5.8 | 4.4 | 2.3 | 4.0 | 3.3 | 3.8 | 2.5 | 3.2 | 3.4 | 2.8 | 5.0 | 3.7 |
| 27 | 6.9 | 7.2 | 4.0 | 4.7 | 4.0 | 4.5 | 3.8 | 4.7 | 5.9 | 3.9 | 4.8 | 4.9 |
| 26 | 7.6 | 5.0 | 4.1 | 5.0 | 6.2 | 5.6 | 5.8 | 5.9 | 7.9 | 3.2 | 5.1 | 5.6 |
| 25 | 5.3 | 3.6 | 6.3 | 4.3 | 8.6 | 6.7 | 6.3 | 6.5 | 8.4 | 6.6 | 7.2 | 6.3 |
| 24 | 5.2 | 4.8 | 5.2 | 5.5 | 8.5 | 5.0 | 8.7 | 8.5 | 8.9 | 7.9 | 7.1 | 6.8 |
| 23 | 4.6 | 7.2 | 6.1 | 5.1 | 7.5 | 6.9 | 8.7 | 7.8 | 7.4 | 6.5 | 9.1 | 7.0 |
| Subtotal | 41.9 | 36.5 | 30.7 | 33.6 | 41.6 | 39.5 | 41.4 | 43.7 | 47.0 | 37.1 | 46.3 | 39.9 |
| 22 and less | 58.1 | 63.5 | 69.3 | 66.4 | 58.4 | 60.5 | 58.6 | 56.3 | 53.0 | 62.9 | 53.7 | 60.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

VESSEL TRAFFIC
(Inbound and Outbound)

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Over 22** | 379 | 382 | 392 | 363 | 334 | 333 | 351 | 357 | 421 | 387 | 449 |
| 22 and less | 525 | 664 | 884 | 717 | 468 | 509 | 497 | 459 | 475 | 657 | 521 |
| Total*** | 904 | 1,046 | 1,276 | 1,080 | 802 | 842 | 848 | 816 | 896 | 1,044 | 970 |

* 1971 figures are not indicated as they reflected a strike situation and are not representative.
** See table 4-1.
***As reported by the San Diego Unified Port District. Includes vessels loading or unloading dry cargo; excludes barges handling lumber.

4. EXISTING TANKER AND BARGE TRAFFIC. Table 4-3 is a record of tanker and barge trips in San Diego Harbor for the period 1960 through 1970. The reduction in barge traffic in 1963 is due to the installation of a petroleum pipeline between Los Angeles and San Diego.

TABLE 4-3

Vessel Traffic, Petroleum and Molasses – Inbound and Outbound
San Diego Harbor, California*

TANKER

| Draft class feet | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 4 | 2 | 4 | 5 | 4 | 4 | 0 | 4 | 1 | 0 | 2 | 30 |
| 35 | 3 | 4 | 6 | 0 | 2 | 0 | 5 | 2 | 2 | 2 | 1 | 27 |
| 34 | 2 | 0 | 0 | 1 | 6 | 9 | 13 | 6 | 1 | 0 | 0 | 38 |
| 33 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 1 | 2 | 3 | 10 |
| 32 | 0 | 1 | 3 | 3 | 2 | 5 | 7 | 4 | 4 | 9 | 9 | 47 |
| 31 | 7 | 14 | 7 | 5 | 4 | 4 | 2 | 0 | 0 | 13 | 13 | 69 |
| 30 | 7 | 9 | 7 | 6 | 4 | 4 | 7 | 3 | 14 | 1 | 3 | 65 |
| 29 | 13 | 4 | 10 | 2 | 2 | 6 | 5 | 2 | 3 | 8 | 8 | 63 |
| 28 | 4 | 2 | 5 | 2 | 5 | 6 | 5 | 6 | 2 | 2 | 2 | 41 |
| 27 | 0 | 5 | 5 | 1 | 6 | 7 | 4 | 1 | 5 | 1 | 5 | 40 |
| 26 | 0 | 2 | 3 | 4 | 10 | 4 | 6 | 9 | 2 | 5 | 1 | 46 |
| 25 | 6 | 0 | 8 | 4 | 4 | 6 | 5 | 4 | 5 | 5 | 4 | 51 |
| 24 | 0 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 4 | 1 | 3 | 26 |
| 23 | 2 | 4 | 8 | 4 | 2 | 3 | 5 | 3 | 3 | 1 | 0 | 35 |
| 22 | 4 | 5 | 0 | 1 | 3 | 2 | 5 | 2 | 4 | 0 | 1 | 27 |
| 21 | 2 | 5 | 3 | 5 | 3 | 1 | 5 | 2 | 1 | 3 | 3 | 33 |
| 20 | 16 | 32 | 31 | 32 | 17 | 9 | 8 | 7 | 4 | 3 | 5 | 164 |
| Subtotal | 70 | 91 | 102 | 79 | 76 | 74 | 87 | 58 | 56 | 56 | 63 | 812 |
| Less than 20 | 70 | 60 | 74 | 67 | 61 | 22 | 26 | 26 | 29 | 41 | 37 | 513 |
| Total | 140 | 151 | 176 | 146 | 137 | 96 | 113 | 84 | 85 | 97 | 100 | 1,325 |

BARGE

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 687 | 538 | 635 | 313 | 103 | 35 | 98 | 86 | 143 | 93 | 128 | 2,859 |

*Source: "Waterborne Commerce of the United States."

5. FUTURE CARRYING CAPACITY OF GENERAL CARGO SHIPS. The U.S. Maritime Administration report gives age, size, speed and draft of vessels. In 1968, the average age of the U.S. merchant fleet was 22 years. Vessel retirement age is 25 years. Most of the commercial vessels calling at the harbor, excluding commercial fishing boats have loaded drafts of from 20 to 30 feet. These include bulk carriers, general cargo carriers, container ships and tankers. (See paragraph 8-07 for additional data on vessel types, numbers, and trips.) Vessels of the C1 and C2 class are gradually being retired and replaced by C3 and C4 mariner class. It is expected that this trend will continue during the 50-year life of the project. Replacement of the existing fleet with vessels of the larger sizes, will result in the movement of greater general cargo tonnage through the harbor. Future general cargo vessels projected for the harbor range in loaded draft from 32 feet to 48 feet.

6. FUTURE CARRYING CAPACITY OF BULK DRY-CARGO VESSELS. Information compiled from "Marine Engineering/Log" revealed that 25 percent of all bulk carriers on order or under construction as of April 1, 1970, have carrying capacities of more than 40,000 deadweight tons with an average draft of 40 feet. The average draft of the total world fleet is 30 feet and that of the U.S. fleet is 32 feet. With the average size of vessels in the existing fleet steadily increasing, greater bulk cargo tonnage will move through the harbor in fewer, larger ships.

7. FUTURE CARRYING CAPACITY OF BULK LIQUID-CARGO VESSELS.

a. Tankers calling at San Diego Harbor range from 5,000-DWT class to the 40,000-DWT class. The larger tankers call at U.S. Navy piers, off loading fuels that are transported to the Miramar Naval Air Station by pipeline. A decrease in the shipment of petroleum products through San Diego Harbor resulted from the construction of a pipeline between Los Angeles and San Diego.

b. The San Diego Gas and Electric Company recently started off-loading tanker fuel shipments at the National City marine terminal. Due to anticipated shortage of natural gas during ensuing years, the company plans to substantially increase its use of fuel oil to generate electricity. This fuel has a high viscosity, must be heated for pumping and cannot be delivered effectively over a long distance pipeline. Shipments are presently limited to 100,000 barrel tankers because of the 30-foot draft limitation south of the Coronado Bridge. With a 35-foot draft channel this oil will be delivered in 250,000 barrel tankers.

8. PROSPECTIVE VESSEL TRAFFIC. All bulk cargo is projected as growth for the 10th Avenue marine terminal except for petroleum products shipped by San Diego Gas and Electric Company to National City marine terminal as discussed previously. General cargo at 10th Avenue marine terminal is expected to reach its capacity prior to 1980, when projected general cargo increases will be handled at National City and future terminals. It is expected that the Port's maximum capacity to process bulk cargo will be reached by 2030. The maximum capacity to handle general cargo is projected to be reached by 2010. Projected cargo for the entire port by type of vessel and cargo is shown in table 4-4 and for general cargo by type of vessel and cargo and terminal destination in table 4-5.

9. **EXISTING AND PROJECTED MARINE TERMINAL AND PIER GROSS AREAS, COVERED STORAGE AREAS AND TONNAGE.** Tables 4-6 and 4-7 show existing and projected marine terminal and pier gross acreage, covered storage consisting of transit sheds and warehouses and tonnage.

TABLE 4-4

Projected Commerce by Type of Vessel and Cargo
San Diego Harbor

| Type of Vessel and Major Item of Commerce | Tonnage (1,000 tons) | | | | | | |
|---|---|---|---|---|---|---|---|
| Imports | 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
| Tankers | | | | | | | |
| Molasses | 65 | 85 | 102 | 123 | 146 | 176 | 213 |
| Petroleum | 628 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 | 1,219 |
| Subtotal | 693 | 1,304 | 1,321 | 1,342 | 1,365 | 1,395 | 1,432 |
| General Cargo | | | | | | | |
| Iron and steel products | 6 | 9 | 12 | 16 | 21 | 21 | 21 |
| News print | 40 | 53 | 67 | 81 | 98 | 98 | 98 |
| Plywood | 37 | 48 | 60 | 70 | 81 | 81 | 81 |
| General cargo – other | 105 | 222 | 424 | 779 | 1,365 | 1,365 | 1,365 |
| Subtotal | 188 | 332 | 563 | 946 | 1,565 | 1,565 | 1,565 |
| Barges | | | | | | | |
| Lumber | 210 | 242 | 274 | 303 | 335 | 372 | 412 |
| Total | 1,091 | 1,878 | 2,158 | 2,591 | 3,265 | 3,332 | 3,409 |
| Exports | | | | | | | |
| Bulk Carriers | | | | | | | |
| Phosphates | 4 | 8 | 12 | 18 | 22 | 22 | 22 |
| Fertilizers | 181 | 315 | 493 | 724 | 902 | 902 | 902 |
| Potash | 128 | 224 | 349 | 514 | 640 | 640 | 640 |
| Scrap steel | 88 | 152 | 238 | 350 | 518 | 518 | 518 |
| Soda ash | 41 | 72 | 112 | 165 | 206 | 206 | 206 |
| Fluorspar | 13 | 23 | 35 | 52 | 65 | 65 | 65 |
| Other agricultural bulk* | 33 | 58 | 90 | 133 | 165 | 165 | 165 |
| Subtotal | 488 | 852 | 1,329 | 1,952 | 2,518 | 2,518 | 2,518 |
| General Cargo | | | | | | | |
| Cotton and linters | 23 | 29 | 35 | 42 | 51 | 51 | 51 |
| Scrap paper | 3 | 4 | 7 | 10 | 15 | 15 | 15 |
| Cargo – other | 66 | 115 | 180 | 264 | 391 | 391 | 391 |
| Subtotal | 92 | 148 | 222 | 316 | 457 | 457 | 457 |
| Total | 580 | 1,000 | 1,551 | 2,272 | 2,975 | 2,975 | 2,975 |
| Total All Commerce | 1,671 | 2,878 | 3,709 | 4,863 | 6,240 | 6,307 | 6,384 |

*Includes alfalfa pellets and hay.

## TABLE 4-5

### Terminal Destination of Projected General Cargo – 10th Avenue Terminal*

| Type of Vessel and Major Item of Commerce General Cargo | Tonnage (1,000 tons) 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|---|---|---|
| **Exports** | | | | | | | |
| Cotton and linters | 23 | 29 | 29 | 29 | 29 | 29 | 29 |
| Scrap paper | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| General cargo – other | 66 | 99 | 99 | 99 | 99 | 99 | 99 |
| Subtotal | 92 | 132 | 132 | 132 | 132 | 132 | 132 |
| **Imports** | | | | | | | |
| Iron and steel products | 6 | 9 | 9 | 9 | 9 | 9 | 9 |
| Newsprint | 40 | 53 | 53 | 53 | 53 | 53 | 53 |
| General cargo – other | 105 | 206 | 206 | 206 | 206 | 206 | 206 |
| Plywood | 37 | 0 | 0 | 00 | 0 | 0 | 0 |
| Subtotal | 188 | 268 | 268 | 268 | 268 | 268 | 268 |
| Total General Cargo | 280 | 400 | 400 | 400 | 400 | 400 | 400 |

*General cargo capacity for 10th Avenue terminal is 400,000 tons. Additional general cargo is projected to be handled at National City and future terminals.

TABLE 4-5 (Continued)

Terminal Destination of Projected General Cargo –
National City Marine Terminal

| Type of Vessel and Major Item of Commerce General Cargo | Tonnage (1,000 tons) 1971 | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|---|---|---|
| Exports | | | | | | | |
| Cotton and linters | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrap paper | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| General cargo – other | | | | | | | |
| Break bulk | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Containerized | 0 | 16 | 81 | 157 | 157 | 157 | 157 |
| Subtotal | 0 | 16 | 81 | 157 | 157 | 157 | 157 |
| Imports | | | | | | | |
| Plywood | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| General cargo – other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Break bulk | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Containerized | 0 | 16 | 218 | 543 | 543 | 543 | 543 |
| Newsprint | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Iron and steel products | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 0 | 16 | 218 | 543 | 543 | 543 | 543 |
| Total | 0 | 32 | 299 | 700 | 700 | 700 | 700 |
| Barges | | | | | | | |
| Lumber | 210 | 242 | 242 | 242 | 242 | 242 | 242 |
| Total General Cargo | 210 | 274 | 541 | 942 | 942 | 942 | 942 |

TABLE 4-5 (Continued)

Terminal Destination of Projected General Cargo – Future Terminals

| Type of Vessel and Major Item of Commerce General Cargo | Tonnage (1,000 tons) 2000 | 2010 | 2020 | 2030 |
|---|---|---|---|---|
| Exports | | | | |
| Cotton and linters | 13 | 22 | 22 | 22 |
| Scrap paper | 6 | 11 | 11 | 11 |
| General cargo – other | | | | |
| Break bulk | 0 | 0 | 0 | 0 |
| Containerized | 8 | 135 | 135 | 135 |
| Subtotal | 27 | 168 | 168 | 168 |
| Imports | | | | |
| Plywood | 70 | 81 | 81 | 81 |
| General cargo – other | | | | |
| Break bulk | 0 | 0 | 0 | 0 |
| Containerized | 30 | 616 | 616 | 616 |
| Newsprint | 28 | 45 | 45 | 45 |
| Iron and steel products | 7 | 12 | 12 | 12 |
| Subtotal | 135 | 754 | 754 | 754 |
| Barges | | | | |
| Lumber | 61 | 93 | 93 | 93 |
| Total General Cargo | 196 | 847 | 847 | 847 |

TABLE 4-6

San Diego Harbor
Existing and Projected Marine Terminal Gross Areas
and Covered Storage Areas

| | Existing (1973) General Cargo Break Bulk | Existing (1973) General Cargo Container | Existing (1973) Other Uses | Projected (2030) General Cargo Break Bulk | Projected (2030) General Cargo Container | Projected (2030) Other Uses |
|---|---|---|---|---|---|---|
| **B Street Pier** | | | | | | |
| Terminal Area | 8.8 ac | 0 | 0.4 ac | 0 | 0 | 0 |
| Transit Shed No. 1 | 128,250 SF | 0 | 0 | 0 | 0 | 0 |
| Transit Shed No. 2 | 115,900 SF | 0 | 0 | 0 | 0 | 0 |
| **10th Avenue Terminal** | | | | | | |
| Terminal Area | 65.5 ac | 0 | 28.5ac | 43.6 ac | 0 | 26.3 ac |
| Transit Shed No. 1 | 193,750 SF | 0 | 0 | 193,750 SF | 0 | 0 |
| Transit Shed No. 2 | 193,750 SF | 0 | 0 | 193,750 SF | 0 | 0 |
| Warehouse A | 48,000 SF | 0 | 0 | 0 | 0 | 0 |
| Warehouse B | 290,650 SF | 0 | 0 | 0 | 0 | 0 |
| Warehouse C | 384,580 SF | 0 | 0 | 384,580 SF | 0 | 0 |
| West Shed | 23,500 SF | 0 | 0 | 23,500 SF | 0 | 0 |
| East Shed | 23,500 SF | 0 | 0 | 23,500 SF | 0 | 0 |
| Sorting Shed | 18,700 SF | 0 | 0 | 18,700 SF | 0 | 0 |
| **National City Terminal** | | | | | | |
| Terminal Area | 0 | 18.7 ac | 45.3 ac | 0 | 36.7 ac | 46.9 ac |
| Transit Shed 24-1 | 0 | 0 | 40,320 SF | 0 | 0 | 40,320 SF |
| Warehouse 24-A | 0 | 32,770 SF | 69,630 SF | 0 | 0 | 102,400 SF |
| Warehouse and Container Stuffing | 0 | 0 | 0 | 0 | 60,000 SF | 0 |
| **Future Terminals** | | | | | | |
| Terminal Area | 0 | 0 | 0 | 79 ac | or 79 ac | 0 |
| Transit Sheds | 0 | 0 | 0 | 320,000 SF | or 0 | 0 |
| Warehouses | 0 | 0 | 0 | 320,000 SF | or 0 | 0 |
| Warehouse and Container Stuffing | 0 | 0 | 0 | 0 | 90,000 SF | 0 |

Gross areas of terminals includes covered storage.

In the above table, the berths listed under "Other Uses" are for handling bulk products, scrap metal, lumber, petroleum products, molasses, heavy machinery loads, and other cargo not classified as "General", and for accommodation of potential maritime industry.

TABLE 4-7

San Diego Harbor Terminal Capacity
Import and Export – Tons Per Annum

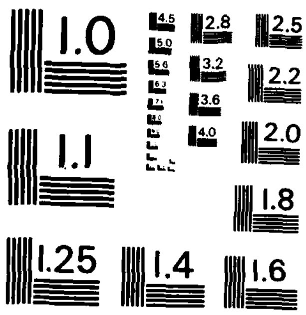
| Terminal | Present Capacity (1973) | Projected Capacity (2030) |
|---|---|---|
| B Street Pier | | |
| General cargo | 160,000 | 0 |
| Other than general | 0 | 0 |
| Total Cargo | 160,000 | 0 |
| 10th Avenue | | |
| General cargo | 400,000 | 400,000 |
| Other than general | 1,692,000 | 2,305,000 |
| Total Cargo | 2,092,000 | 2,705,000 |
| National City | | |
| General cargo* | 350,000 | 700,000 |
| Other than general | 1,739,000 | 1,739,000 |
| Total Cargo | 2,089,000 | 2,439,000 |
| Future terminals | | |
| General cargo* | 0 | 1,050,000 |
| Other than general | 0 | 318,000 |
| Total Cargo | 0 | 1,368,000 |

*Based on all containerized cargo.

AD-A136 672 NAVIGATION IMPROVEMENT DESIGN MEMORANDUM NUMBER 1 GENERAL DESIGN FOR SAN..(U) ARMY ENGINEER DISTRICT LOS ANGELES CA FEB 75

3/4

UNCLASSIFIED F/G 13/2 NL




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

10. ANALYSIS OF AVAILABLE BERTHING SPACE. "B" Street Pier is almost 50 years old but has some remaining use as a general cargo handling facility. With the increasing urbanization of the adjacent areas and inadequate land traffic access, however, its use for general cargo handling is definitely restricted to a limited period of time.

11. The 10th Avenue Terminal is presently the Port's busiest terminal and handles by far most of the general cargo. The two berths along the north face have only a 30-foot water depth and are without immediately adjacent transit sheds for accumulating general cargo. These berths are used for barges, loading and unloading heavy machinery and other bulky cargo, and for the off-loading of petroleum products and molasses. The berth at the south face is occupied by the ship-loading end of the Port's bulk loading facility, consisting of a conveyor gallery and a large railmounted shiploader, and is not suitable for general cargo handling. The four berths along the west face were designed and constructed for the specific purpose of accommodating general cargo and are equipped with adjacent transit sheds.

12. The National City Terminal is the Port's newest cargo facility. It was constructed during the past five years with fifty percent financial participation of the Federal Government through the Economic Development Administration. Only a portion of the new development was set aside for cargo handling while the remainder, in accordance with provisions of the Federal Grant, is intended for suitable water-oriented industry which will produce a high rate of employment, with emphasis on ethnic minorities. Accordingly, about one-fourth of the entire area is now occupied by an International Telegraph and Telephone Company cable plant which ships its products over the adjacent Sweetwater Wharf. Additional areas near this wharf, though presently unoccupied, are similarly intended for industries which need to be located near navigable water. During the interim period, the three berths at Sweetwater Wharf are used chiefly for lumber unloading from coastal barges and for mooring other barges and equipment employed in harbor maintenance work, such as dump barges and oil recovery barges. In any case, the above mentioned commitment to the Federal Government precludes construction adjacent to this wharf of extensive transit sheds which are prerequisite to a general cargo facility.

13. Of the two berths at the north end of the National City Terminal, one is suitable only for barge traffic because of the shallow water depth, and the other is used for outbound steel scrap movements. At the channel or west face, one berth is located adjacent to the scrap stockpile and is also used with increasing frequency for off-loading of fuel oil for the San Diego Gas and Electric Company's South Bay Power Plant. A recently completed berth on the west face has been developed into a container terminal as eventually will be the adjacent 800 linear feet of shoreline to the south.

14. CAPACITY OF GENERAL CARGO BERTHS AT SAN DIEGO. Experience at the Port of San Diego and elsewhere as well, has shown that the capacity for handling general break bulk cargo depends almost totally on the amount of covered storage space available adjacent to the wharf and to a much lesser extent on the length of berthing space. Each of the previously mentioned four general cargo berths at 10th Avenue Terminal has 100,000 square feet of adjacent transit shed space. Experience at this Port furthermore has shown that on the average only about 100,000 weight tons of general cargo can be handled annually over a berth with an adjacent 100,000 square feet of covered space. Unlike some

other larger ports, much of San Diego's inbound cargo is bulkly and light, resulting in four to six times the so-called measurement tonnage (one measurement ton equals 40 cubic feet). Moreover, ships calling at this port usually only load or discharge partial loads, which further tends to increase the relative requirement for cargo space. As a consequence, general cargo must now on occasion be stored outside where damage is not always avoidable.

15. Under present conditions, the Port's terminal facilities can efficiently and safely handle only about 400,000 weight tons of general break bulk cargo, not including the "B" Street Pier which, as stated, has a limited remaining life span for this purpose. The only practicable site available for further development appears to be the Chula Vista area immediately south of the National City Terminal, sometimes referred to as the future "D" Street Terminal.

16. There are other potential needs for marine terminal space which, without an additional site, cannot be met. These include areas for handling imported automobiles, refrigerated products, bananas and other commodities which could be shipped at a savings directly to this area as it grows in population and expands in industrial capacity. Additionally, replacement areas must be found for the interim activities at the Sweetwater berths, when this space is turned over to maritime industry, as originally planned and intended. Without providing some added room for expansion, the Port would soon be constrained in its development. In view of the large Navy holdings there are, unfortunately, no sites in the Bay where adjacent deep water channels, sufficient back-up areas, and vital land transportation links are conducive to further marine terminal development.

17. In summary, it is expected that there will be in the foreseeable future only the four berths of 10th Avenue Terminal available for the efficient and safe handling of general break bulk cargo at the Port of San Diego, two berths at National City in addition to three or four berths at future terminals for containerized cargo.

18. PROJECTIONS OF TONNAGE TO THE VARIOUS TERMINALS. It is estimated that during this fiscal year the Port of San Diego will be handling about 300,000 tons of general cargo, mostly at 10th Avenue terminal. It is further estimated that this terminal is being operated at about 75 percent or somewhat less than its general cargo handling capacity. It can therefore handle at least 400,000 tons of break bulk cargo in addition to its other uses.

19. Although the total general cargo volume is expected to increase, the ratio of break bulk to containerized cargo will continue to decrease substantially. Most likely the amount of break bulk cargo will remain near the 400,000 ton level and can continue to be accommodated at the 10th Avenue terminal. The anticipated increase in general cargo is expected to be of the containerized type. The two container berths at the National City terminal, one existing and one future, will be capable of handling a total of approximately 700,000 tons of containerized cargo. Most of the remaining general cargo, which we may logically assume will be containerized, must be handled at a future terminal. Based on the projected cargo tonnage for 2030, this remaining amount would be 922,000 tons. (See tables 4-4, 4-5, 4-6 and 4-7.)

20. TRENDS. The future may bring about other methods of handling and shipping general cargo without necessarily changing the projected volumes. In recent years there have been developed so-called "LASH" and "Roll-On Roll-Off" ships. The Port of San Diego has already been visited a number of times by the former type of vessel. It is difficult to make future projections as to the volume of cargo which may be on- or off-loaded by these vessels at the Port of San Diego. The small barges or lighters which are a component of the LASH ship can easily be accommodated at existing terminal facilities. Roll-On Roll-Off facilities could be constructed in the future without conflicting with other Port terminal installations.

# APPENDIX 5

## ESTIMATE OF BENEFITS

## SAN DIEGO HARBOR, CALIFORNIA

## APPENDIX 5

## ESTIMATE OF BENEFITS
## SAN DIEGO HARBOR, CALIFORNIA

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## APPENDIX 5

## ESTIMATE OF BENEFITS
## SAN DIEGO, CALIFORNIA

1. GENERAL. The estimated benefits that would accrue from the proposed improvement at San Diego Harbor are those that would result directly from the improvement and are reducible to tangible monetary values. These benefits include: (a) savings from use of large ships; (b) extended economic life from advance utility replacement; and (c) land enhancement. As part of the analysis of the benefits, a study was made of the Port of Ensenada as a competitive port.

### PORT OF ENSENADA

2. The Port of Ensenada was investigated originally for two reasons. The first was to determine if the Port could be considered a feasible alternative to the Los Angeles–Long Beach Harbor complex. If it was found that overland transportation to and from this port was less costly than the Los Angeles–Long Beach Harbor alternative, then savings and benefits from San Diego Harbor improvements would be less. The second was to appraise the Port of Ensenada as a competitive harbor to the Port of San Diego. Deletion of "D" Street Terminal from the project removed the need to analyze the Port of Ensenada for a determination of overland transportation cost savings. However, the information obtained in the investigation, for this purpose, was incorporated in the evaluation of the Port as a competitive harbor. To provide required data, discussions were held with the marketing manager and director of trade development of the SDUPD, a representative of the National Port Coordinating Commission in Mexico, and various trucking and railroad companies. The following information and conclusions are presented as a result of the investigation.

a. Overland Transportation Costs. Mexican trucking rates are approximately $3 to $4 per ton from Ensenada to the U.S.-Mexican border. However, some Mexican truck cargo is unloaded at the border and put in warehouses until it clears customs, then it is loaded on American trucks. In other cases, American trucks hitch directly onto trailers brought to the border. These situations do result in some increasing transportation costs. Also, rail service is unavailable from the Port of Ensenada to the border. Although labor costs at the Port of Ensenada are relatively low, approximately 55 cents per hour, production per hour is less than at U.S. ports.

b. Historical Movement of Cargo from the Port of Ensenada through the Port of San Diego. Information relative to the historical movement of cargo from the Port of Ensenada through the Port of San Diego is not readily available. A representative of the Maritime Administration stated that the Port of Ensenada is not on a normal trade route, therefore the information needed would require several months to assemble. Waterborne imports from Mexico through the Port of San Diego without designation of port of origin was available for selected years. For the year 1960, the value of imports was $279,312. In the years 1966, 1967 and 1968, tonnage of cargo was 22,224, 44,903 and 34,462 respectively, and value of imports was $400,262, $1,011,876 and $594,892 respectively.

c. Recent Cargo Movements through the Port of Ensenada. Until recently, the Port has shipped about 25,000 tons of cotton (mostly Mexican) per year; however, this quantity has slacked off. Additional outbound cargoes of wheat, fruit (fresh and dried) and wine are estimated to amount to less than 1,000 tons per year. About 500 tons per month of general cargo moves from the Port of Ensenada to La Paz. Also, 500 tons per month of general cargo are imported from Japan and Europe on the 5 foreign-flag vessels which enter the Port each month. The Port is attempting to obtain a portion of the 30,000 tons per year of cargo from Europe that moves through San Diego Port into Tijuana. San Diego Port officials do not believe that Ensenada will be successful in their efforts and do not believe they will become competitive. The San Diego, Arizona and Eastern Railroad line, subsidiary of the Southern Pacific Line, sold a portion of their trunk line in Mexico to the Mexican Government.

d. Competitive Harbor. The Port of Ensenada was a fishing port until its first exports of cotton in 1958. The port now contains four deep-draft berths (28.8 feet) and one shallow berth. The Port provides fuel, water, warehouses, and loading equipment for shippers. A 100,000 square-foot, cotton shed and two large enclosed sheds (100,000 and 150,000 square feet, respectively) for general cargo were constructed. Facilities for the storage of about 5,000 tons of wheat are provided in addition to the cotton storage.

e. Conclusion. The Port of Ensenada does not appear to be a significant, competitive harbor for the following reasons. (1) The Port of Ensenada does not have berths of sufficient depth to accommodate the tonnage projections. (2) Although labor and truck costs are low, per hour production is low, pilfering is extensive, and additional costs are incurred replacing Mexican trucks with American trucks for hauling trailers, warehousing, and customs inspections at the border. (3) Air, rail and truck facilities and backup areas in San Diego Harbor provide more convenient and expeditious handling of cargo. (4) It is reasonable to assume that American industry and shippers would prefer moving goods through American ports due to reduced risks and greater convenience unless the cost savings were sufficient to compensate for losses. Since no information on future plans for the Port of Ensenada was available, no assessment could be made with respect to any future change in its competitive position.

## EVALUATION OF BENEFITS

3. Estimated average annual benefits to be derived from the proposed improvements are summarized in the following paragraphs.

4. SAVINGS RESULTING FROM USE OF LARGE SHIPS. Savings in transportation costs accrue to the project because deeper channel depths enable larger or more heavily loaded ships to be used, resulting in lower per-ton shipping costs. Benefits were calculated on the basis of a 50-year project life beginning in 1980 and were calculated incrementally for deepening the channel to depths ranging from 33 feet to 45 feet. Depths greater than 45 feet are infeasible because they would require an excessive amount of dredging, including dredging of the entrance channel. In calculating benefits no distinction was made between tonnage distribution to the immediate and general tributary areas.

5. CARGO VESSEL COSTS. Costs are based on July 1972 cost levels for cargo vessels, October 1972 for bulk carriers and tankers and December 1972 for containers. At the present time (1973) operating costs of foreign flag vessels are about 69 percent of those for United States flag vessels.

6. The mean hourly costs presented in table 5-1 are adjusted costs, allowing for the estimated fleet composition in the foreign and domestic fleets. It is assumed that the future distribution of shipments between domestic and foreign ports for the period 1973-2030 will conform to that given in appendix 3 "Economics Study." At present, except for lumber and molasses, there are few domestic shipments or receipts at San Diego Harbor. Available data also indicate that 53 percent of the total shipments to foreign ports are in foreign flag vessels. For purposes of determining future hourly operating costs, it is assumed that vessels in the coastwise and Hawaiian trade are United States flag vessels. Although foreign flag vessel operating costs may increase relative to United States flag vessels, we do not have sufficient data to support this; therefore the ratio of these costs were kept constant for the projection period. (See table 5-1.) Plates 5-1A to 5-1D shows the relationship between the carrying capacity of vessels and hourly cost.

7. The method used for estimating these benefits is as follows: Savings were computed for each channel depth. These savings are the equivalent annual value of the difference between the cost of shipping the projected without-project cargo in the optimum ship for the existing depth and the cost of shipping the same cargo in the optimum ship for each alternative depth. The optimum ship for each type of vessel is the ship in which cargo can be transported with the least cost per ton. The types of vessels considered were general cargo, container, dry bulk carriers and tankers. (See tables 5-2 and 5-3.) Optimization analysis is realistic in terms of the number and sizes of ships in the world fleet. Cargo densities were considered in the optimization analysis through the use of immersion factors furnished by OCE Transportation and Coastal Zone Branch for dry bulk carriers and tankers and District Coastal Resources Branch for container ships. These immersion factors indicate the ship depths in inches in water as a result of cargos of various densities and tonnages. The immersion factors are shown in table 5-4.

TABLE 5-1

Estimated Future Adjusted Mean Hourly Dry-Cargo Vessel
Operating Costs – San Diego Harbor, California

| Carrier and year | *U.S. flag vessel operating costs | Distribution of shipments: To foreign ports | Distribution of shipments: In foreign flag vessel | Operating costs, foreign to U.S. flag vessels | Adusted hourly cost |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |
| | Dollars per hour | Percent | Percent | Ratio | Dollars per hour |
| Bulk Carriers | | | | | |
| 1972-2030 | $ 650 | 100 | .53 | 0.69 | $ 544 |
| General Cargo Carriers | | | | | |
| 1972-2030 | $ 681 | 100 | .53 | 0.69 | $ 545 |
| Container Ships | | | | | |
| 1972-2030 | $1,066 | 100 | .53 | 0.69 | $1,026 |

| Foreign Flag | | United States Flag | |
|---|---|---|---|
| (0.53) (450) | + | (0.47) (650) = | 544 |
| (0.53) (425) | + | (0.47) (681) = | 545 |
| (0.53) (990) | + | (0.47) (1066) = | 1,026 |

Note: For Bulk Carriers, costs are the same for all channel depths except 45 Ft. ($571 per hour). Costs are the same for General Cargo Carriers for all depths, costs for Container Ships range from $626 per hour for 30 Ft. depth to $1,026 per hour for 40 Ft. depth.

*From OCE – Transportation and Coastal Zone Branch 1972.

TABLE 5-2

Savings From Use of Large Vessels
10th Avenue Marine Terminal
(Tonnage and Dollar Value in Thousands)

| | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | Equivalent Annual Savings (3-1/4 percent) |
|---|---|---|---|---|---|---|---|
| Existing Channel | | | | | | | |
| Depth 33 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 575 | 592 | 613 | 636 | 666 | 703 | --- |
| Shipping cost | 711 | 772 | 848 | 932 | 1,041 | 1,175 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 700 | 1,091 | 1,586 | 2,000 | 2,000 | 2,000 | --- |
| Shipping cost | 2,366 | 3,688 | 5,361 | 6,760 | 6,760 | 6,760 | --- |
| General cargo carriers | | | | | | | |
| Break bulk | | | | | | | |
| Tonnage | 400 | 400 | 400 | 400 | 400 | 400 | --- |
| Shipping cost | 2,965 | 2,965 | 2,965 | 2,965 | 2,965 | 2,965 | --- |
| Total tonnage | 1,675 | 2,083 | 2,599 | 3,036 | 3,066 | 3,103 | --- |
| Total shipping cost | 6,042 | 7,425 | 9,174 | 10,657 | 10,766 | 10,900 | --- |
| Projected Channel | | | | | | | |
| Depth 40 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 575 | 592 | 613 | 636 | 666 | 703 | --- |
| Shipping cost | 553 | 601 | 660 | 724 | 809 | 913 | --- |
| Bulk cargo | | | | | | | |
| Tonnage | 700 | 1,091 | 1,586 | 2,000 | 2,000 | 2,000 | --- |
| Shipping cost | 1,807 | 2,814 | 4,092 | 5,160 | 5,160 | 5,160 | --- |
| General cargo | | | | | | | |
| Break bulk | | | | | | | |
| Tonnage | 400 | 400 | 400 | 400 | 400 | 400 | --- |
| Shipping cost | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | --- |
| Total shipping cost | 5,116 | 6,171 | 7,508 | 8,640 | 8,725 | 8,829 | --- |
| Savings | 925 | 1,253 | 1,665 | 2,017 | 2,041 | 2,072 | 1,510 |

TABLE 5-2 (Continued)

| | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | Equivalent Annual Savings (3-1/4 percent) |
|---|---|---|---|---|---|---|---|
| Projected Channel | | | | | | | |
| Depth 42 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 575 | 592 | 613 | 636 | 666 | 703 | --- |
| Shipping cost | 518 | 563 | 619 | 679 | 759 | 856 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 700 | 1,091 | 1,586 | 2,000 | 2,000 | 2,000 | --- |
| Shipping cost | 1,737 | 2,707 | 3,934 | 4,960 | 4,960 | 4,960 | --- |
| General cargo carriers | | | | | | | |
| Break bulk | | | | | | | |
| Tonnage | 400 | 400 | 400 | 400 | 400 | 400 | --- |
| Shipping cost | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | --- |
| Total shipping cost | 5,011 | 6.026 | 7,309 | 8,395 | 8,475 | 8,572 | --- |
| Savings | 1,031 | 1,399 | 1,866 | 2,260 | 2,289 | 2,326 | 1,691 |
| Projected Channel | | | | | | | |
| Depth 43 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 575 | 592 | 613 | 636 | 666 | 703 | --- |
| Shipping cost | 502 | 545 | 599 | 658 | 735 | 829 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 700 | 1,091 | 1,586 | 2,000 | 2,000 | 2,000 | --- |
| Shipping cost | 1,710 | 2,662 | 3,871 | 4,882 | 4,882 | 4,882 | --- |
| General cargo carriers | | | | | | | |
| Break bulk | | | | | | | |
| Tonnage | 400 | 400 | 400 | 400 | 400 | 400 | --- |
| Shipping cost | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | --- |
| Total shipping cost | 4,968 | 5,963 | 7,226 | 8,296 | 8,373 | 8,467 | --- |
| Savings | 1,077 | 1,460 | 1,949 | 2,360 | 2,395 | 2,435 | 1,768 |

TABLE 5-2 (Continued)

| | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | Equivalent Annual Savings (3-1/4 percent) |
|---|---|---|---|---|---|---|---|
| Projected Channel | | | | | | | |
| Depth 45 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 575 | 592 | 613 | 636 | 666 | 703 | --- |
| Shipping cost | 478 | 520 | 572 | 628 | 702 | 793 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 700 | 1,091 | 1,586 | 2,000 | 2,000 | 2,000 | --- |
| Shipping cost | 1,666 | 2,597 | 3,775 | 4,760 | 4,760 | 4,760 | --- |
| General cargo carriers | | | | | | | |
| Break bulk | | | | | | | |
| Tonnage | 400 | 400 | 400 | 400 | 400 | 400 | --- |
| Shipping cost | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | 2,756 | --- |
| Total shipping cost | 4,900 | 5,873 | 7,103 | 8,144 | 8,218 | 8,309 | --- |
| Savings | 1,139 | 1,550 | 2,070 | 2,511 | 2,546 | 2,589 | 1,876 |

TABLE 5-3

Savings From Use of Large Vessels
National City Marine Terminal
(Tonnage and Dollar Value in Thousands)

| | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | Equivalent Annual Savings (3-1/4 percent) |
|---|---|---|---|---|---|---|---|
| Existing Channel | | | | | | | |
| Depth 30 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 729 | 729 | 729 | 729 | 729 | 729 | --- |
| Shipping cost | 685 | 685 | 685 | 685 | 685 | 685 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 152 | 238 | 350 | 518 | 518 | 518 | --- |
| Shipping cost | 578 | 904 | 1,330 | 1,968 | 1,968 | 1,968 | --- |
| Container Ships | | | | | | | |
| Tonnage | 32 | 299 | 700 | 700 | 700 | 700 | --- |
| Shipping cost | 304 | 2,831 | 6,629 | 6,629 | 6,629 | 6,629 | --- |
| Total tonnage | 913 | 1,266 | 1,779 | 1,947 | 1,947 | 1,947 | --- |
| Total shipping cost | 1,567 | 4,420 | 3,644 | 9,282 | 9,282 | 9,282 | --- |
| Projected Channel | | | | | | | |
| Depth 33 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 729 | 729 | 729 | 729 | 729 | 729 | --- |
| Shipping cost | 598 | 598 | 598 | 598 | 598 | 598 | --- |
| Bulk cargo carriers | | | | | | | |
| Tonnage | 152 | 238 | 350 | 518 | 518 | 518 | --- |
| Shipping cost | 514 | 804 | 1,183 | 1,751 | 1,751 | 1,751 | --- |
| Container ships | | | | | | | |
| Tonnage | 32 | 299 | 700 | 700 | 700 | 700 | --- |
| Shipping cost | 274 | 2,565 | 6,006 | 6,006 | 6,006 | 6,006 | --- |
| Total shipping | 1,386 | 3,967 | 7,787 | 8,355 | 8,355 | 8,355 | --- |
| Savings | 179 | 453 | 857 | 928 | 928 | 928 | 627 |

TABLE 5-3 (Continued)

| | 1980 | 1990 | 2000 | 2010 | 2020 | 2030 | Equivalent Annual Savings (3-1/4 percent) |
|---|---|---|---|---|---|---|---|
| Projected Channel Depth 35 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 729 | 729 | 729 | 729 | 729 | 729 | --- |
| Shipping cost | 554 | 554 | 554 | 554 | 554 | 554 | --- |
| Bulk carriers | | | | | | | |
| Tonnage | 152 | 238 | 350 | 518 | 518 | 518 | --- |
| Shipping cost | 468 | 733 | 1,078 | 1,595 | 1,595 | 1,595 | --- |
| Container ships | | | | | | | |
| Tonnage | 32 | 299 | 700 | 700 | 700 | 700 | --- |
| Shipping cost | 272 | 2,539 | 5,943 | 5,943 | 5,943 | 5,943 | --- |
| Total shipping cost | 1,294 | 3,826 | 7,575 | 8,092 | 8,092 | 8,092 | --- |
| Savings | 272 | 595 | 1,069 | 1,190 | 1,190 | 1,190 | 811 |
| Projected Channel Depth 37 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 729 | 729 | 729 | 729 | 729 | 729 | --- |
| Shipping cost | 518 | 518 | 518 | 518 | 518 | 518 | --- |
| Bulk carriers | | | | | | | |
| Tonnage | 152 | 238 | 350 | 518 | 518 | 518 | --- |
| Shipping cost | 435 | 681 | 1,001 | 1,481 | 1,481 | 1,481 | --- |
| Container ships | | | | | | | |
| Tonnage | 32 | 299 | 700 | 700 | 700 | 700 | --- |
| Shipping cost | 266 | 2,478 | 5,803 | 5,803 | 5,803 | 5,803 | --- |
| Total shipping cost | 1,219 | 3,677 | 7,322 | 7,802 | 7,802 | 7,802 | --- |
| Savings | 349 | 745 | 1,323 | 1,481 | 1,481 | 1,481 | 1,011 |
| Projected Channel Depth 40 feet | | | | | | | |
| Tankers | | | | | | | |
| Tonnage | 729 | 729 | 729 | 729 | 729 | 729 | --- |
| Shipping cost | 467 | 467 | 467 | 467 | 467 | 467 | --- |
| Bulk carriers | | | | | | | |
| Tonnage | 152 | 238 | 350 | 518 | 518 | 518 | --- |
| Shipping cost | 392 | 614 | 903 | 1,336 | 1,336 | 1,336 | --- |
| Container ships | | | | | | | |
| Tonnage | 32 | 299 | 700 | 700 | 700 | 700 | --- |
| Shipping cost | 264 | 2,466 | 5,775 | 5,775 | 5,775 | 5,775 | --- |
| Total shipping cost | 1,123 | 3,547 | 7,145 | 7,578 | 7,578 | 7,578 | --- |
| Savings | 444 | 874 | 1,500 | 1,705 | 1,705 | 1,705 | 1,173 |

NOTE: Savings may not equal existing depth cost minus alternative cost due to independent rounding.

TABLE 5-4

| Vessel Size in Tons | Immersion Factors Fully Loaded Vessels Long Tons Per/Inch U.S. | Foreign | Fully Loaded Capacity – Tons U.S. | Foreign |
|---|---|---|---|---|
| Dry Bulk Vessels | | | | |
| 26,000 | 90 | 90 | | |
| 35,000 | 117 | 117 | | |
| 60,000 | 163 | 163 | | |
| 80,000 | | 200 | | |
| 100,000 | | 235 | | |
| 150,000 | | 297 | | |
| General Cargo Vessels | | | | |
| 8,750 | 34 | 34 | | |
| 11,300 | 40 | 40 | | |
| 14,600 | 48 | 48 | | |
| 21,000 | 64 | 64 | | |
| Container Vessels | | | | |
| 15,600 | 58 | 58 | 12,100 | 12,100 |
| 19,300 | 67 | 67 | 14,300 | 14,300 |
| 26,300 | 86 | 86 | 19,100 | 19,100 |
| 48,000 | | 140 | | 27,600 |
| Tanker Vessels | | | | |
| 26,000 | 90 | 90 | | |
| 37,000 | 117 | 117 | | |
| 47,000 | 145 | 145 | | |
| 60,000 | 163 | 163 | | |
| 70,000 | 183 | 183 | | |
| 80,000 | 200 | 200 | | |
| 90,000 | 213 | 213 | | |
| 100,000 | 235 | 235 | | |
| 120,000 | 268 | 268 | | |
| 150,000 | 297 | 297 | | |
| 210,000 | 350 | 350 | | |
| 225,000 | 353 | 353 | | |

NOTE: Data was provided by OCE except for containers which was provided by the District Coastal section. Computer program has converted the long tons per inch to short tons per inch. Light loaded vessel factors were derived from a formula provided by OCE. These factors are not indicated above. They are part of a computer program.

8. In order to determine the least cost per ton for shipping each type of cargo to or from San Diego Harbor, for the existing depth and each alternative controlling depth, it was necessary to determine the optimum size and loading for the ship used to transport this cargo. The operation of the computer programs used for this purpose is summarized below.

9. The problem may be divided into two phases. The first phase is to determine, for each ship, the optimum delivery policy by examining the trade off between delay costs and the decrease in cargo carrying capacity when the vessel is light loaded. An example of this problem would be the case of a vessel with a fully loaded draft of 36 feet evaluated for the alternative channel depth of 38 feet. It is feasible for the vessel to enter the harbor fully loaded by waiting, on the average, 1.6 hours for 3 feet of tide. This will allow the vessel 5 feet of water under the keel to compensate for squat and to permit safe and efficient operation. Likewise it is feasible to light load the vessel 3 feet and avoid waiting outside the harbor. Other combinations of light loading and waiting outside the harbor are also feasible.

10. The method used to find the cost of the optimum delivery policy consists of the following steps:

a. Compute the cost of a vessel trip, for each size ship, from the appropriate source to San Diego Harbor, using data and formulas supplied by the Transportation and Coastal Zone Branch, OCE. Any vessel that could be handled in the harbor, either fully or lightly loaded, is considered.

b. For each size vessel compute the quantity of cargo that can be carried in a full vessel and in a vessel that is light loaded to various drafts in one foot increments. For container ships the relationship between cargo carrying capacity and depths was developed independently because there are no reliable formulas for computing carrying capacities for these ships.

c. For each ship, determine the amount of waiting time associated with each feasible draft, multiply this waiting time by the per hour sea cost of the vessel, add the product to the cost of the vessel trip determined in step (1), and divide the resultant sum by the quantity of cargo carried determined in step (2). The foregoing computations provide the cost per ton for each delivery policy.

11. The second phase of the problem is to compare the optimum delivery policy for all feasible ships and to select the least cost ship.

12. This process is repeated for each alternative controlling depth to develop a benefit for each alternative project. (See plates 5-2A-B-C-D.)

13. The next section contains an analysis of vessel delays which were used in computing the savings resulting from use of large ships.

14. Analysis of Vessel Delays. Local interests state that under existing conditions considerable time is lost by vessels awaiting favorable tides. A study of navigation in San Diego Harbor indicates that waiting time varies considerably for different types of vessels and is largely dependent on loading and draft of the vessel, stage of tide, direction of wind, and other variable local conditions. A primary requirement for a vessel operating under self-propulsion is sufficient water under the keel to compensate for squat and to permit safe and efficient operations.

15. Required Depth Under Keel For Safe Navigation. EM 1110-2-1607 was used as the basis for determining the effect of squat for most deep draft vessels and the clearance required under the keel for safe navigation. In computing vessel waiting time, required clearance must be added to squat, to give the effective depth under the keel when the vessel is not in motion, i.e., for safe navigation, a vessel with a static draft of 33 feet requires a water depth equal to the static draft, plus 3 feet clearance under keel, plus 2.0 feet for squat. Therefore, a water depth of 38 feet would provide a 5-foot clearance under the keel.

16. Under present conditions, vessels drawing 28 feet or more will encounter delays going to the 10th Avenue marine terminal, and vessels drawing 25 feet and more will encounter delays south of the 10th Avenue marine terminal, based on a present available depth of 33 feet at the 10th Avenue terminal and 30 feet to the south.

17. To estimate the amount of time vessels wait for a favorable tide, a mean tide curve for San Diego Harbor was drawn at Broadway Pier. This curve gives the mean depth of water throughout a complete lunar day of 24.8 hours. The curve is shown on plate 5-3 of this appendix.

18. Assuming a 5-foot allowance for squat, trim and keel clearance, plate 5-3 shows that with a tide of 3 feet, a vessel drawing 31 feet could be delayed for a maximum of 7.2 hours. The computation is based on the assumption that vessels will characteristically arrive and depart at regular intervals throughout the lunar day. Thus, for vessels of a particular draft, the probability of delay would be in direct proportion to the period of time when sufficient depth of water was not available (See table 5-5.)

TABLE 5-5

Hours of Delay Per Vessel Trip, San Diego, California.

| Vessel draft feet | Probability of delay (percent)* | Waiting time (average hours per delay)* | Probable Delay per vessel trip (hours) for controlling depth of: 30 ft | 33 ft | 35 ft | 37 ft | 40 ft | 42 ft |
|---|---|---|---|---|---|---|---|---|
| 39 | | | | | | | | 0.7 |
| 38 | | | | | | | 1.6 | 0.3 |
| 37 | | | | | | 9.3 | 0.7 | 0 |
| 36 | | | | | | 2.8 | 0.3 | |
| 35 | | | | | 9.3 | 1.6 | 0 | |
| 34 | | | | | 2.8 | 0.7 | | |
| 33 | | | | 9.3 | 1.6 | 0.3 | | |
| 32 | | | | 2.8 | 0.7 | 0 | | |
| 31 | | | | 1.6 | 0.3 | | | |
| 30 | 86.0 | 10.8 | 9.3 | 0.7 | 0 | | | |
| 29 | **36.8 & ***30.6 | 4.5 &3.8 | 2.8 | 0.3 | | | | |
| 28 | **29.0 & ***21.4 | 3.6 & 2.6 | 1.6 | 0 | | | | |
| 27 | **22.6 & *** 6.05 | 2.8 & 0.7 | 50.7 | | | | | |
| 26 | 15.3 | 1.9 | 0.3 | | | | | |
| 25 | 0 | 0 | 0 | | | | | |

* For a controlling depth of 30 feet. For each additional foot of water depth the probability of delay and waiting time decreases.

** First tidal curve depression (LLW).

***Second tidal curve depression (HLW).

## LAND ENHANCEMENT BENEFITS

19. LAND ENHANCEMENT. Material dredged from the project channels would be deposited in submerged tideland areas that have been tentatively selected as sites for disposal of spoil. The areas selected are those shown on plate 6 of the main report.

20. Construction of retaining dikes to prevent return of spoil material to the bay would be required. The estimated cost to local interests of the retaining dikes for the proposed project is $575,000.

21. Benefits from land enhancement are to be based on the net increased market value or the cost of equivalent fill, whichever is less.

22. The net market value of the filled land would be about $73,000 per acre for 5th Avenue. (Net market value derived by deducting present value of sites and development cost from market value.)

23. The cost of equivalent fill was based on the assumption that local interests could make the fills at the same unit cost as that used for dredging the proposed improvement. This unit cost was obtained by averaging the estimated cost for dredging the various channels and adding appropriate percentages for contingencies, supervision and administration and engineering and design. The 5th Street fill would require 1,306,000 cubic yards, and would create 22 acres of land. The proposed dredging program would provide more than enough material for the fill. The fill required was multiplied by the cost per cubic yard and diking costs were then added. This cost was compared to the net increased market value to determine which was the lesser for the fill site. The lesser value was the net increased market value of the filled land ($76,590 compared to $73,000 per acre). Table 5-6 gives a detailed analysis of land enhancement benefits. Analysis of benefits is based on EM,1120-2-118. Interest earned on the land is figured at 7 percent per annum. The annual equivalent factor was based on 3-1/4 percent and growth periods as shown in table 5-6.

TABLE 5-6

Land Enhancement Benefits – San Diego Harbor, California

| Location | Area of fill | Total enhanced value | Net income per annum at 7 percent | Growth period | Annual equivalent factor | Annual Equivalent benefit |
|---|---|---|---|---|---|---|
| | Acres | | | | | |
| 5th Avenue | 22.00 | $1,584,000 | $110,880 | 5 | .92354 | $102,400 |

NOTE: Land enhancement benefits remain the same for all depths due to the environmental constraints of the fill area. Additional fill material other than required for 5th Street will be placed on beach areas, with no resultant land enhancement, or disposed in the ocean.

24. The location of the proposed fill was based on the present master plan of the Port District. The 5th Avenue area is scheduled to be a commercial and recreational site. At one time, a marine terminal was proposed for this location, but the backup area available for the rail net was insufficient. After initial filling, a development time of 5 years is estimated for this area. The fill material for the National City marine terminal, opened in fiscal year 1969-70, was dredged by local interests. The filling of the terminal area and the extension of the South Bay channel will allow orderly development of these facilities.

## ADVANCE REPLACEMENT OF UTILITIES BENEFITS

25. Advance Replacement Utilities Benefits. Submarine utility lines belonging to the U.S. Navy, the Pacific Telephone and the San Diego Electric Company will have to be relocated when the channel depths are increased. The California-American Water Company relocated their waterline crossing the bay and the telegraph company removed its submarine cable crossing the bay subsequent to project authorization. The Navy will utilize a newly-installed sewerline, installed by the City of Coronado. The full cost of the replacements is included, as appropriate, in the Federal or non-Federal cost. In accordance with EM 1120-2-104, a partially compensating benefit can be credited to the utility replacements because of the lenghtened economic life of the features. EM 1120-2-104 states that where the replaced facilities serve a non-project purpose, the benefit taken will not exceed the cost of the new feature, less the value of the replaced one. Table 5-7 shown an evaluation of these benefits and the required calculations, using an interest rate of 3-1/4 percent.

TABLE 5-7

Advance Utility Replacement Benefits
San Diego Harbor, California
(in thousands of dollars)

| Owner | Feature | Remaining Economic Life | Remaining Value | Cost of Replacement | Economic Life of Replacement | | |
|---|---|---|---|---|---|---|---|
| | | Years | | | | UCRF<br>50 yrs | U<br>3 |
| U.S. Navy | 16" water line<br>20" water line | 15 | 400. | 1,200 | 50 | .04073 | 20.7 |
| | 18" sewer line | 15 | | | | UCRF<br>50 yrs | U<br>3 |
| San Diego Gas and Electric Co. | 2 power cables | 5 | 80 | 407 | 31 | .05167 | 17.3 |
| | | | | | | UCRF<br>31 yrs | U<br>2 |
| San Diego Gas and Electric Co. | 1 power cable | 15 | 45 | 200 | 31 | .05167 | 12.3 |
| | | | | | | UCRF<br>31 yrs | U<br>1 |
| San Diego Gas and Electric Co. | 1-10" gas line | 20 | 102 | 660 | 40 | .04503 | 14.5 |

Pacific Telephone and Telegraph Company's four communication cables will be relocated, therefore are not included in benefits.

Note: UCRF – Uniform Capital Recovery Factor

UPWF – Uniform Present Worth Factor

SPWF – Single Payment Present Worth Factor

For each utility the equivalent annual value as computed is less than the equivalent annual value of the difference between the cost o utility.

Example Computation –

Equivalent Annual Benefits = Cost of Replacement x UCRF (Economic life or replacement) x UPWF (Economic life of replacement - SPWF (Remaining economic life of existing improvement) x UCRF (Project life), i.e. for the gas line equipment, equivalent annual benefits are say 9.3

TABLE 5-7

Advance Utility Replacement Benefits
San Diego Harbor, California
(in thousands of dollars)

| Remaining Value | Cost of Replacement | Economic Life of Replacement | Computation of Equivalent Annual benefits of extended utility life over 50-year project life at 3-1/4 percent | | | | |
|---|---|---|---|---|---|---|---|
| | | | UCRF 50 yrs | UPWF 35 yrs | SPWF 15 yrs | UCRF 50 yrs | Equivalent Annual Benefits |
| 400. | 1,200 | 50 | .04073 | 20.72389 | .61894 | .04073 | 25.5 |
| | | | UCRF 50 yrs | UPWF 35 yrs | SPWF 15 yrs | UCRF 50 yrs | |
| 80 | 407 | 31 | .05167 | 17.37323 | .85222 | .04073 | 12.7 |
| | | | UCRF 31 yrs | UPWF 26 yrs | SPWF 5 yrs | UCRF 50 yrs | |
| 45 | 200 | 31 | .05167 | 12.32436 | .61894 | .04073 | 3.2 |
| | | | UCRF 31 yrs | UPWF 16 yrs | SPWF 15 yrs | UCRF 50 yrs | |
| 102 | 660 | 40 | .04503 | 14.53935 | .52747 | .04073 | 9.3 |
| | | | | | | | Total 50.7 |

bles

is less than the equivalent annual value of the difference between the cost of replacement and the remaining value of the existing

F (Economic life or replacement) x UPWF (Economic life of replacement – remaining economic life of existing improvement) x (Project life), i.e. for the gas line equipment, equivalent annual benefits are 660 x .04503 x 14.53935 x .52747 x .04073 = 9.2833



2

## SUMMARY OF BENEFITS AND COSTS FOR ALTERNATIVE CHANNEL DEPTHS

26. Estimates of First Costs and Equivalent Annual Charges. Estimates of first costs and annual charges for alternative depths are shown in table 5-8. These costs are based on 1973 prices including allowances for engineering overhead and contingencies. Details of cost estimates for alternative depths are found in the first section of the report. The interest rates used in computing the annual charges is 3-1/4 percent, and the project life is considered to be 50 years.

27. Estimates of Annual Benefits. A summary of estimated equivalent annual benefits for alternative channel depths is shown in table 5-9. Benefits accrue to various alternative depths as a result of savings from the use of larger ships, land enhancement due to the use of dredged.materials, and advance utility replacement.

## BENEFIT COST RATIOS

28. Net Benefits. The estimated annual equivalent benefits and costs, the ratio of benefits to cost and the net annual equivalent benefits for the 10th Avenue and National City marine terminal are shown in table 5-10 for alternative channel depths. The principle of maximization of net benefits has been applied in the formulation of the recommended project which is discussed in the section on summary of economics of the recommended project.

29. The net equivalent annual benefits range from $1,689,000 for 40 foot (*10th* Avenue terminal) and 33 foot (National City marine terminal) depths to $2,232,000 for the 43-40 foot depths. Depths greater than 45 feet were considered for the entire channel including the channel entrance and the channels near the Navy's turning basin, but resulted in excessive costs in terms of benefits generated.

TABLE 5-8

Estimates Of Costs For Alternate Depths
(in thousands of dollars)

| *Alternate Depth No. | Federal First Cost | Non-Federal First Cost | Total First Cost | Federal Annual Charges | Non-Federal Annual Charges | Total Annual Charges |
|---|---|---|---|---|---|---|
| 1 | 11,040 | 2,735 | 13,775 | 490 | 111 | 601 |
| 2** | 12,105 | 2,780 | 14,885 | 533 | 113 | 646 |
| 3 | 13,208 | 2,827 | 16,035 | 578 | 115 | 693 |
| 4 | 14,915 | 2,900 | 17,815 | 647 | 118 | 765 |
| 5 | 11,945 | 2,770 | 14,715 | 527 | 113 | 640 |
| 6 | 13,010 | 2,815 | 15,825 | 570 | 115 | 685 |
| 7 | 14,113 | 2,862 | 16,975 | 615 | 117 | 732 |
| 8 | 15,820 | 2,935 | 18,755 | 684 | 120 | 804 |
| 9 | 13,345 | 2,834 | 16,179 | 584 | 115 | 698 |
| 10 | 14,410 | 2,879 | 17,289 | 627 | 117 | 744 |
| 11 | 15,513 | 2,926 | 18,439 | 672 | 119 | 790 |
| 12*** | 17,220 | 2,999 | 20,219 | 740 | 122 | 862 |
| 13 | 16,058 | 2,949 | 19,007 | 694 | 120 | 814 |
| 14 | 17,123 | 2,994 | 20,117 | 737 | 122 | 857 |
| 15 | 18,226 | 3,041 | 21,267 | 782 | 124 | 906 |
| 16 | 19,933 | 3,114 | 23,047 | 851 | 127 | 978 |

*See paragraph 9-11 for a description of alternatives.
**Recommended alternative for project.
***Alternative with maximum net benefits.

1) Excludes self-liquidating items.

2) Non-Federal costs varied only in the amount of the cash contribution. For example, dikes were the same for each plan. Utilities under each plan were either to be placed on the bottom surface or placed at -55 ft. MLLW.

3) Amortization of initial investment over the 50 year life of the project at 3-1/4 percent, .04073 x the first cost.

4) Includes additional annual maintenance cost of $40,000 per year.

TABLE 5-9

Summary of Estimates of Equivalent
Annual Benefits for Alternative
Channel Depths
(in thousands)

| Channel Depth (ft.) | Savings Resulting from Use of Larger Ships | Land Enhancement | Advance*** Utility Replacement | Total Benefits |
|---|---|---|---|---|
| 33* | 627 | 0 | 0 | 627 |
| 35 | 811 | 0 | 0 | 811 |
| 37 | 1,011 | 0 | 0 | 1,011 |
| 40 | 1,173 | 0 | 0 | 1,173 |
| 40** | 1,510 | 102 | 51 | 1,663 |
| 43 | 1,768 | 102 | 51 | 1,921 |
| 45 | 1,876 | 102 | 51 | 2,029 |

* 33 ft. to 40 ft. – National City terminal.
** 40 ft. to 45 ft. – 10th Avenue terminal.
***Benefits accrue to 10th Avenue terminal as all utility relocations are in the 10th Avenue terminal area.

TABLE 5-10

San Diego Harbor
Summary of Benefits and Costs for Alternative Depths
10th and National City Marine Terminals

| Channel Alternatives* | Equivalent Annual Benefits ($1,000) | Equivalent Annual Costs ($1,000) | Benefit-Cost Ratios | Net Benefits ($1,000) |
|---|---|---|---|---|
| 1 | 2,290 | 601 | 3.8 | 1,689 |
| 2** | 2,474 | 646 | 3.8 | 1,828 |
| 3 | 2,674 | 693 | 3.9 | 1,981 |
| 4 | 2,836 | 765 | 3.7 | 2,071 |
| 5 | 2,471 | 640 | 3.9 | 1,831 |
| 6 | 2,655 | 685 | 3.9 | 1,970 |
| 7 | 2,855 | 732 | 3.9 | 2,123 |
| 8 | 3,017 | 804 | 3.8 | 2,213 |
| 9 | 2,548 | 698 | 3.7 | 1,850 |
| 10 | 2,732 | 744 | 3.7 | 1,988 |
| 11 | 2,932 | 790 | 3.7 | 2,142 |
| 12*** | 3,094 | 862 | 3.6 | 2,232 |
| 13 | 2,656 | 814 | 3.3 | 1,842 |
| 14 | 2,840 | 859 | 3.3 | 1,981 |
| 15 | 3,040 | 906 | 3.4 | 2,134 |
| 16 | 3,202 | 978 | 3.3 | 2,224 |

* See paragraph 9-11 for a description of alternatives.
** Recommended project.
*** Project with maximum net benefits.

## SUMMARY OF ECONOMICS OF PROJECT WITH MAXIMUM NET BENEFITS

30. Estimates first costs for the project are $17,220,000 for Federal and $2,999,000 for non-Federal, for a total of $20,219,000. Estimates of annual equivalent costs are $741,000 for Federal and $122,000 non-Federal for a total of $862,000. Details of cost estimates for the recommended project are discussed in the first section of the report.

31. Tangible Benefits. The benefits of the project are estimated as follows: (a) $2,941,000, savings resulting from use of large ships; (b) $102,000, land enhancement; and $51,000, advance utility replacement. Total equivalent annual benefits are $3,094,000. See table 5-11.

32. Benefits and costs are based upon an interest rate of 3-1/4 percent for 50 years.

33. Intangible Benefits. Intangible benefits of the project are discussed in detail in appendix 8 "Socio-Economic Effects of the Proposed Project".

34. Maximum Net Benefits. Net benefits are maximized at channel depths of 40 feet for the National City marine terminal and 43 feet for the 10th Avenue marine terminal. These benefits are estimated at $2,232,000, see table 5-10. Table 5-13 shows incremental benefits and costs for alternative channel depths.

35. Benefit Cost Ratio. Equivalent annual benefits are estimated at $3,094,000 and equivalent annual costs are estimated at $862,000 for a benefit cost ratio of 3.6. See table 5-12.

TABLE 5-11

Summary of Equivalent Annual Venefits
for Project With Maximum Net Benefits
San Diego Harbor
(in thousands)

| Channel Depth (ft.) | Savings Resulting From Use of Larger Ships | Land Enhancement | Advance Utility Replacement | Total Benefits |
|---|---|---|---|---|
| 43* | $1,768 | $102 | $51 | $1,921 |
| 40** | 1,173 | 0 | 0 | 1,173 |
| Total | $2,941 | $102 | $51 | $3,094 |

* 10th Avenue marine terminal.
** National City marine terminal.

NOTE: Maximum net benefits are for alternatives studied. Future terminal is not included.

TABLE 5-12

Summary of Economics for Improvements –
Project With Maximum Net Benefits –
(in thousands)

| Item | Value |
|---|---|
| Total First Cost | $20,219 |
| Equivalent Annual Charges | $862 |
| Equivalent Annual Benefits | $3,094 |
| Benefit-Cost Ratio* | 3.6 |
| Intangible Benefits | Large |

*Based upon maximum net benefits of channel depths –

43 ft. – 10th Avenue
40 ft. – National City marine terminal

Future terminal is not included.

TABLE 5-13

Incremental Benefits - Costs For
Alternative Channel Depths

| Channel Depths (Ft.) Entrance to Mile 8.84 10th Avenue Marine Terminal | Equivalent Annual Savings From Use Of Large Ships | Other Equivalent Annual Benefits | Total Equivalent Annual Benefits | Incremental Benefits | Equivalent Annual Costs | Incremental Costs | Net Benefits |
|---|---|---|---|---|---|---|---|
| 33 | -- | -- | - | -- | -- | -- | -- |
| 34 | 385 | 153 | 538 | 538 | 26 | 26 | 512 |
| 35 | 661 | 153 | 814 | 276 | 52 | 26 | 762 |
| 36 | 870 | 153 | 1,023 | 209 | 78 | 26 | 945 |
| 37 | 1,046 | 153 | 1,199 | 176 | 104 | 26 | 1,095 |
| 38 | 1,217 | 153 | 1,370 | 171 | 130 | 26 | 1,240 |
| 39 | 1,377 | 153 | 1,530 | 160 | 156 | 26 | 1,374 |
| 40 | 1,510 | 153 | 1,663 | 133 | 183 | 27 | 1,480 |
| 41 | 1,627 | 153 | 1,780 | 117 | 203 | 20 | 1,577 |
| 42 | 1,691 | 153 | 1,844 | 64 | 222 | 19 | 1,622 |
| 43 | 1,768 | 153 | 1,921 | 77 | 280 | 58 | 1,641 |
| 44 | 1,825 | 153 | 1,978 | 57 | 338 | 58 | 1,640 |
| 45 | 1,876 | 153 | 2,029 | 51 | 396 | 58 | 1,633 |
| Mile 8.84 to 12.9+ – National City marine terminal | | | | | | | |
| 30 | -- | -- | -- | -- | -- | -- | -- |
| 31 | 213 | 0 | 213 | 213 | 375 | 375 | -162 |
| 32 | 448 | 0 | 448 | 235 | 395 | 20 | 53 |
| 33 | 627 | 0 | 627 | 179 | 418 | 23 | 209 |
| 34 | 728 | 0 | 728 | 101 | 440 | 22 | 288 |
| 35 | 811 | 0 | 811 | 83 | 463 | 23 | 348 |
| 36 | 910 | 0 | 910 | 99 | 486 | 23 | 424 |
| 37 | 1,011 | 0 | 1,011 | 101 | 510 | 24 | 501 |
| 38 | 1,076 | 0 | 1,076 | 65 | 534 | 24 | 542 |
| 39 | 1,127 | 0 | 1,127 | 51 | 558 | 24 | 569 |
| 40 | 1,173 | 0 | 1,173 | 46 | 582 | 24 | 591 |

## SUMMARY OF ECONOMICS FOR THE SAN DIEGO HARBOR PROJECT

36. The economic study reveals that, for alternatives studied, net benefits increase through channel depths of 43 feet at the 10th Avenue terminal, and 40 feet at National City marine terminal. Benefits from the project include: (a) savings in cargo shipping costs resulting from the use of large ships; (b) land enhancement resulting from creation of land by deposits of fill and diking; and (c) extended economic life of utility replacement. (Equivalent net benefits are $1,828,000.)

37. It is noted that the project authorized by Congress on July 23, 1968 provided for a channel depth of 40 feet at the 10th Avenue terminal and 35 feet at the National City merine terminal.

38. The benefit-cost ratio for 43 and 40 foot channels is 3.6 and for 40 and 35 foot channels is 3.4. For the project with 43 and 40 foot depths an increase of $172,000 in equivalent annual expenditures will produce an increase of $404,000 in equivalent annual benefits.

39. The most important factor limiting the project to 40 foot and 35 foot channel depths are budgetary constraints, ($17,220,000 for 43 foot and 40 foot depths compared to $13,526,000 for 40 foot and 35 foot channel depths – Federal first costs).

40. It is concluded on the basis of these factors that the most feasible project to serve immediate needs would be based upon the 40 foot depth at 10th Avenue terminal and 35 foot depth at National City marine terminal (see table 5-14). It is recommended, however, that prior to 1985 the project be revaluated in terms of changed economic, social and environmental conditions and vessel trends to determine the justification for deeper channels and an additional site or sites for terminals. If an additional site or sites are required then an analysis will be made to determine the most feasible location or locations for the terminals.

TABLE 5-14

Summary of Economics
Recommended Project*
(in thousands)

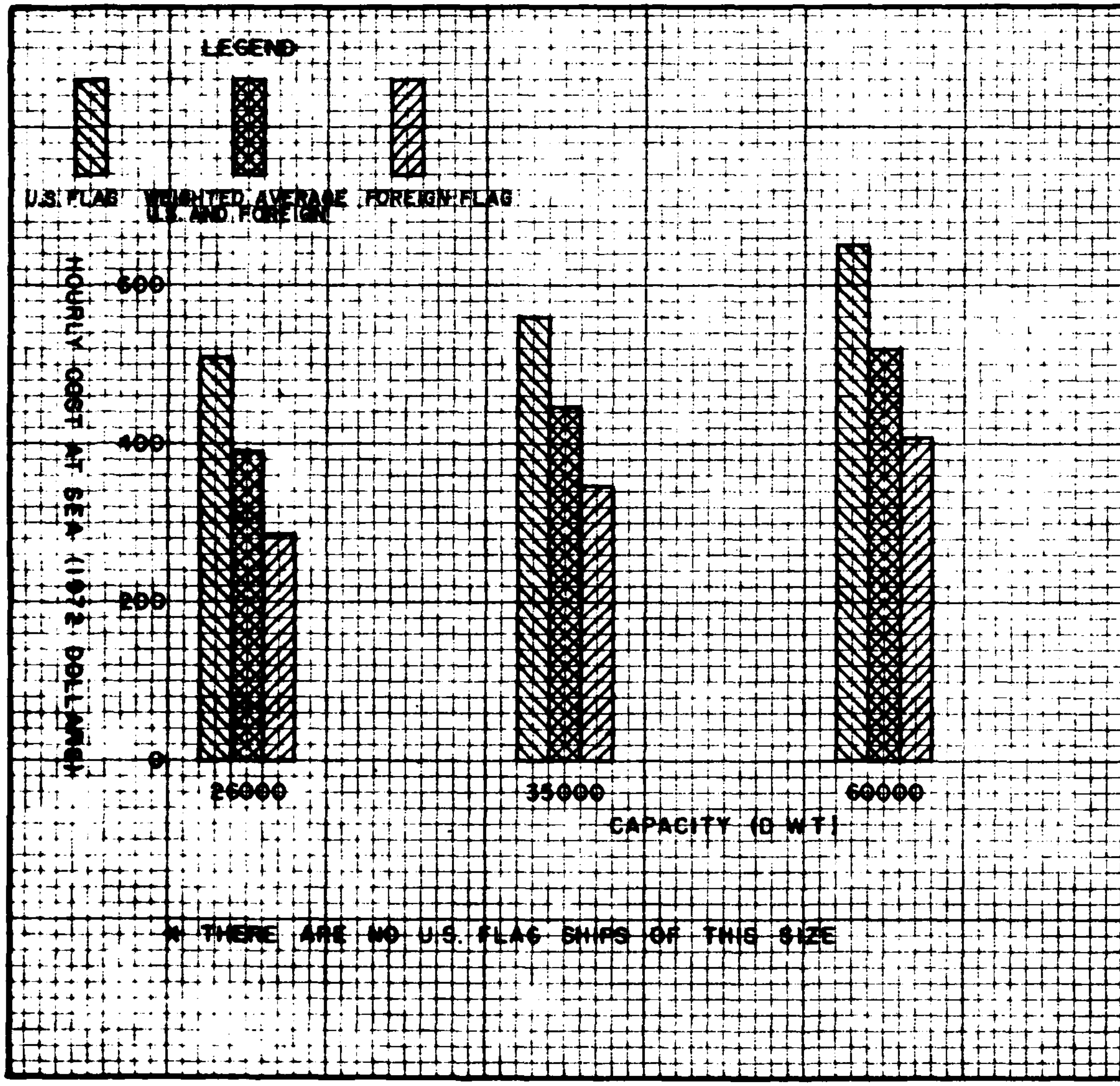
| Item | Value |
|---|---|
| Total First Cost (1973 prices) | $14,885 |
| Equivalent Annual Charges | $646 |
| Equivalent Annual Benefits | $2,474 |
| Benefit-Cost Ratio | 3.4 |
| Intangible Benefits | Large |

*Based upon 40 foot channel depth for 10th Avenue marine terminal and 35 feet channel depth for National City marine terminals.

NOTE: Benefits and costs are based upon an interest rate of 3-1/4 percent for a 50 year project.

An interest rate of 6-7/8 percent for a 50 year project results in equivalent annual charges of $1,101,000 and equivalent annual benefits of $2,186,000 for a benefit-cost ratio of 2.0.

"Benefits and costs have increased based upon 1974 price levels. First, costs and annual charges increased to $16,696,000 and $725,000, respectively. Inasmuch as data to update the benefits was not readily available and the benefit-cost ratio was slightly reduced to 3.4 without the benefit increase, it was decided for the purpose of preventing unnecessary delay in processing this report to fargo updating the benefits."

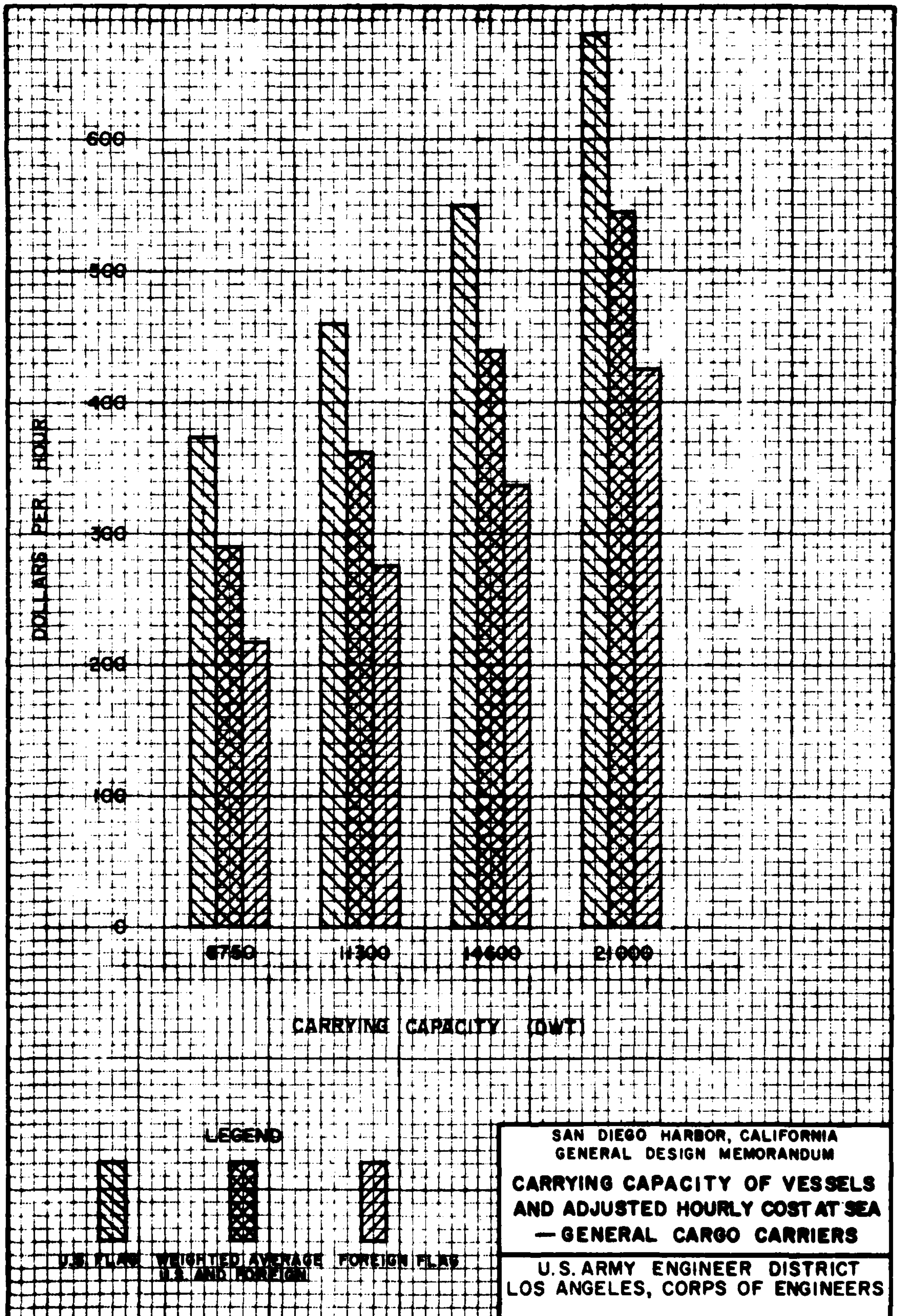



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

CARRYING CAPACITY OF VESSELS
AND ADJUSTED HOURLY COST AT SEA
DRY BULK CARRIERS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 5-1A

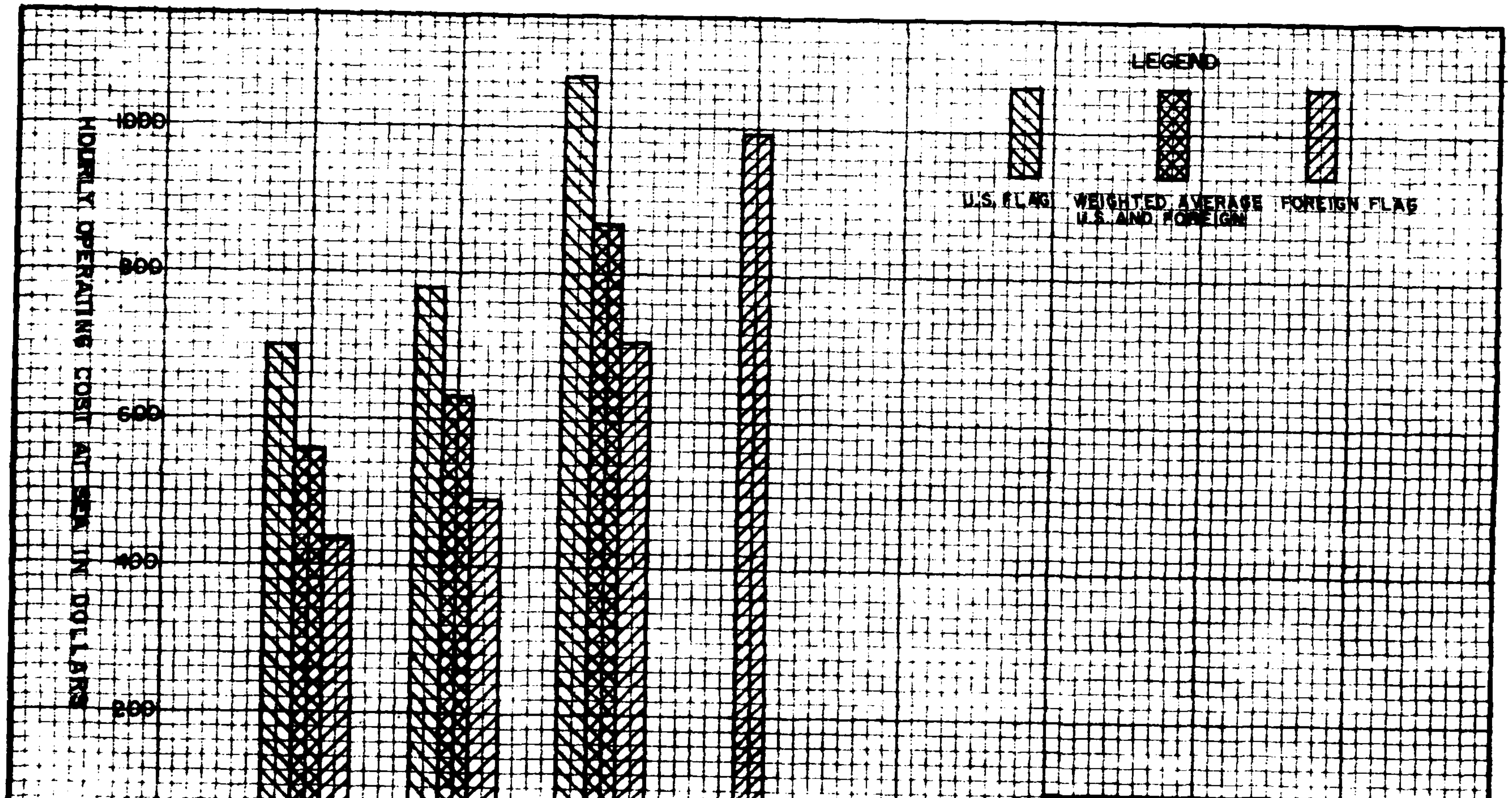



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

**CARRYING CAPACITY OF VESSELS AND ADJUSTED HOURLY COST AT SEA — GENERAL CARGO CARRIERS**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 5-18

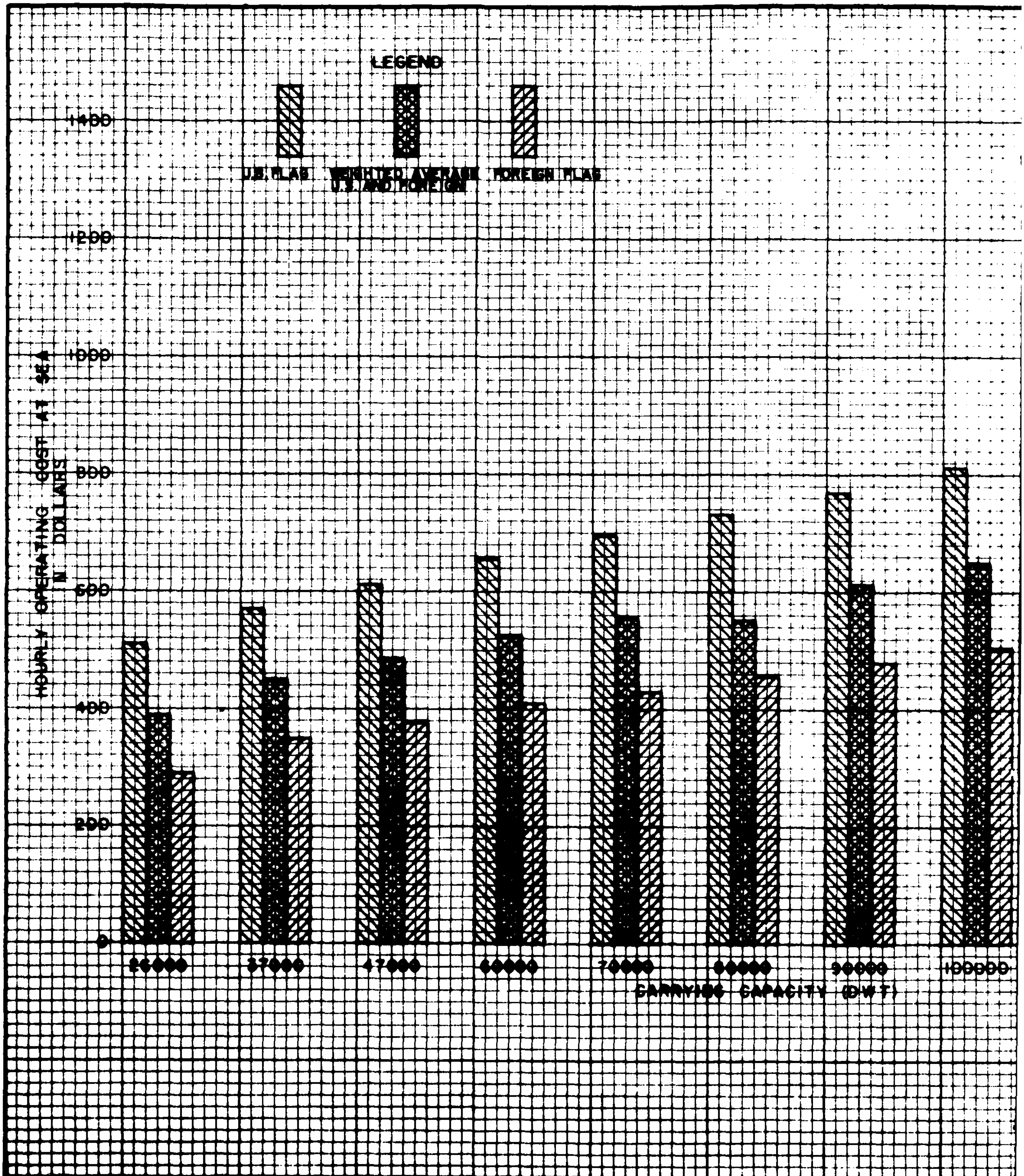



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

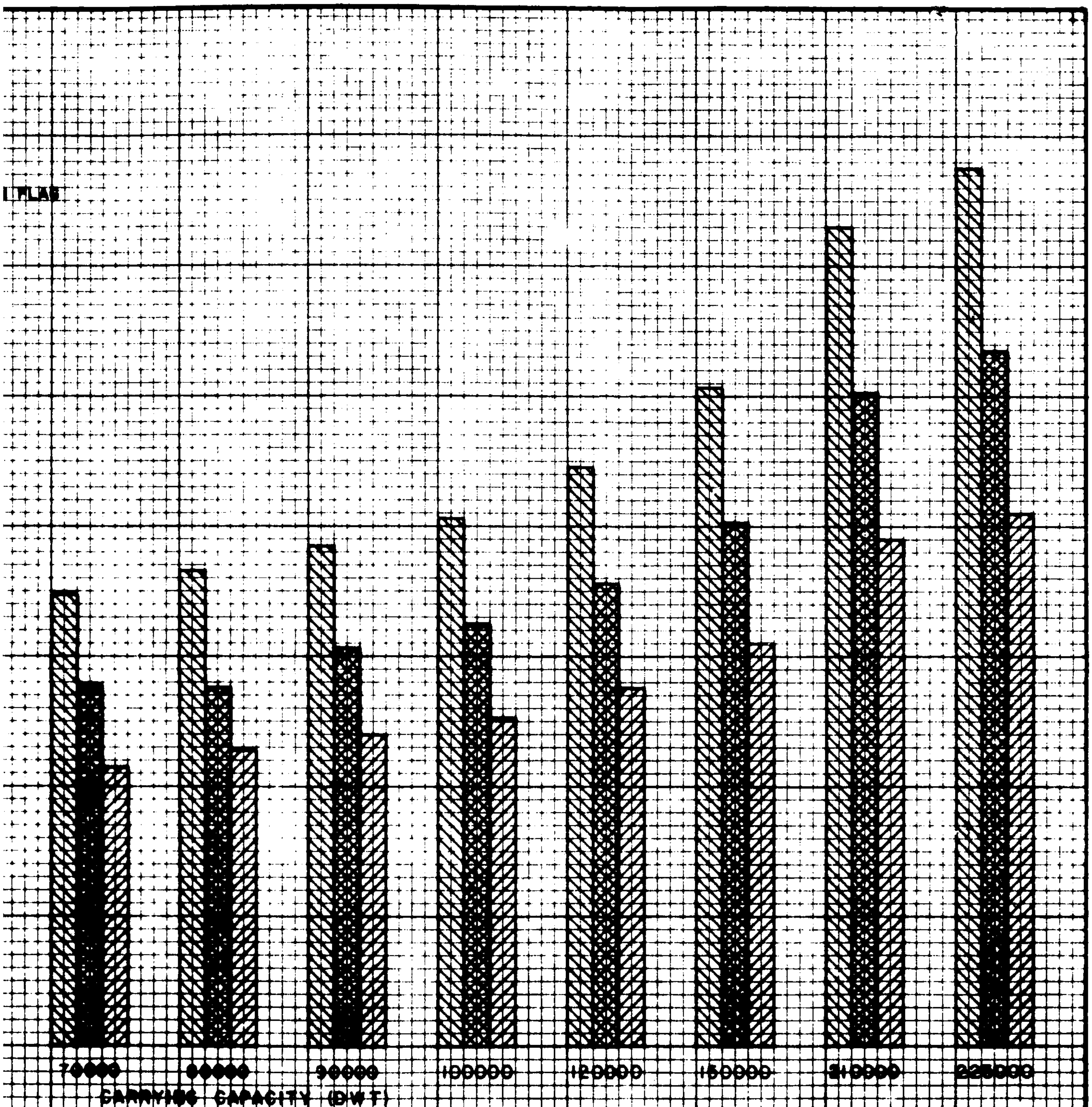
**CARRYING CAPACITY OF VESSELS AND ADJUSTED HOURLY COST — CONTAINER SHIPS**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 5-1C



LEGEND
U.S. FLAG
WEIGHTED AVERAGE U.S. AND FOREIGN
FOREIGN FLAG
HOURLY OPERATING COST AT SEA IN DOLLARS
1400
1200
1000
800
600
400
200
0
37000
47000
70000
90000
100000
CARRYING CAPACITY (DWT)




SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

**CARRYING CAPACITY OF VESSELS AND ADJUSTED HOURLY COST TANKERS**

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

PLATE 5-1D

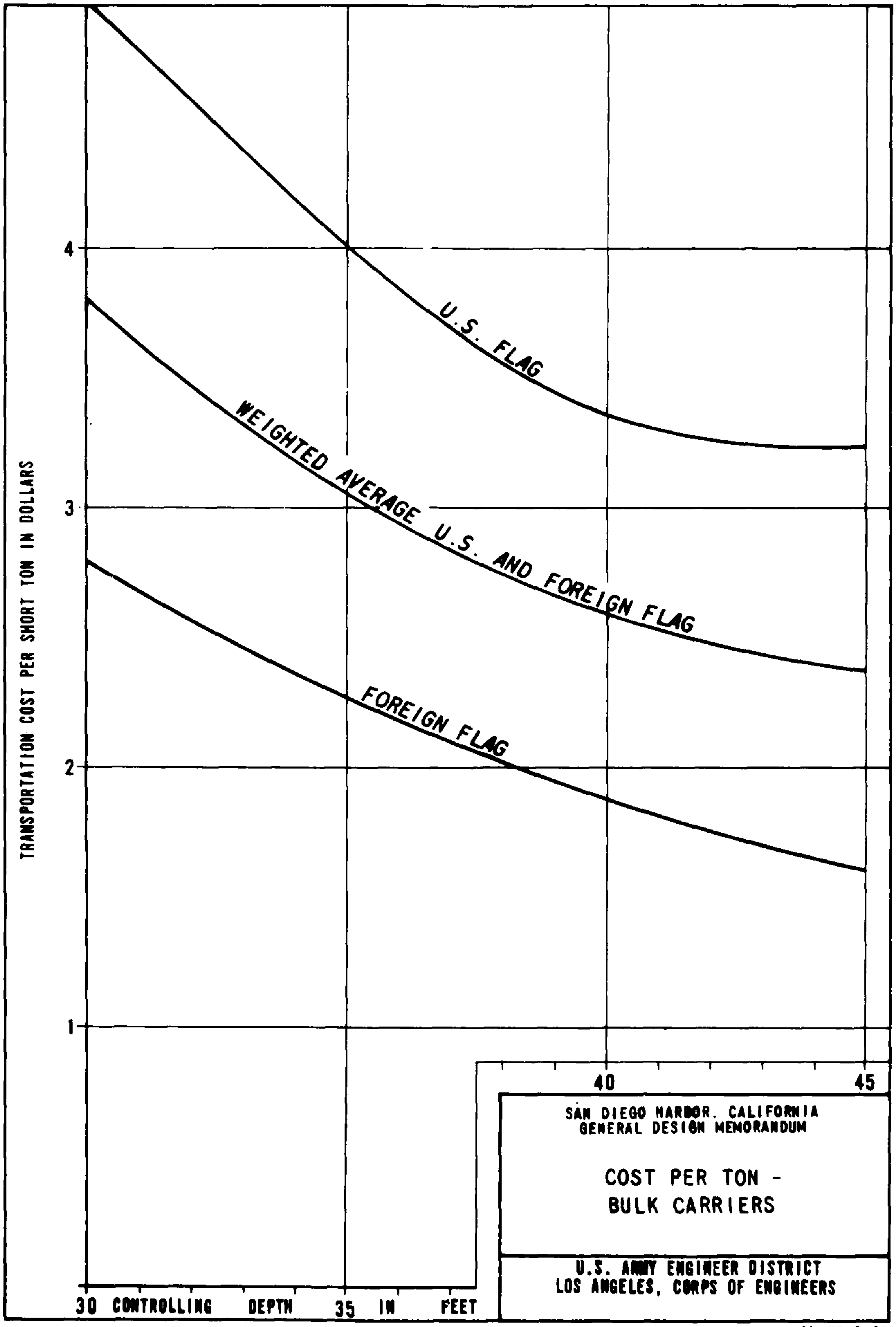
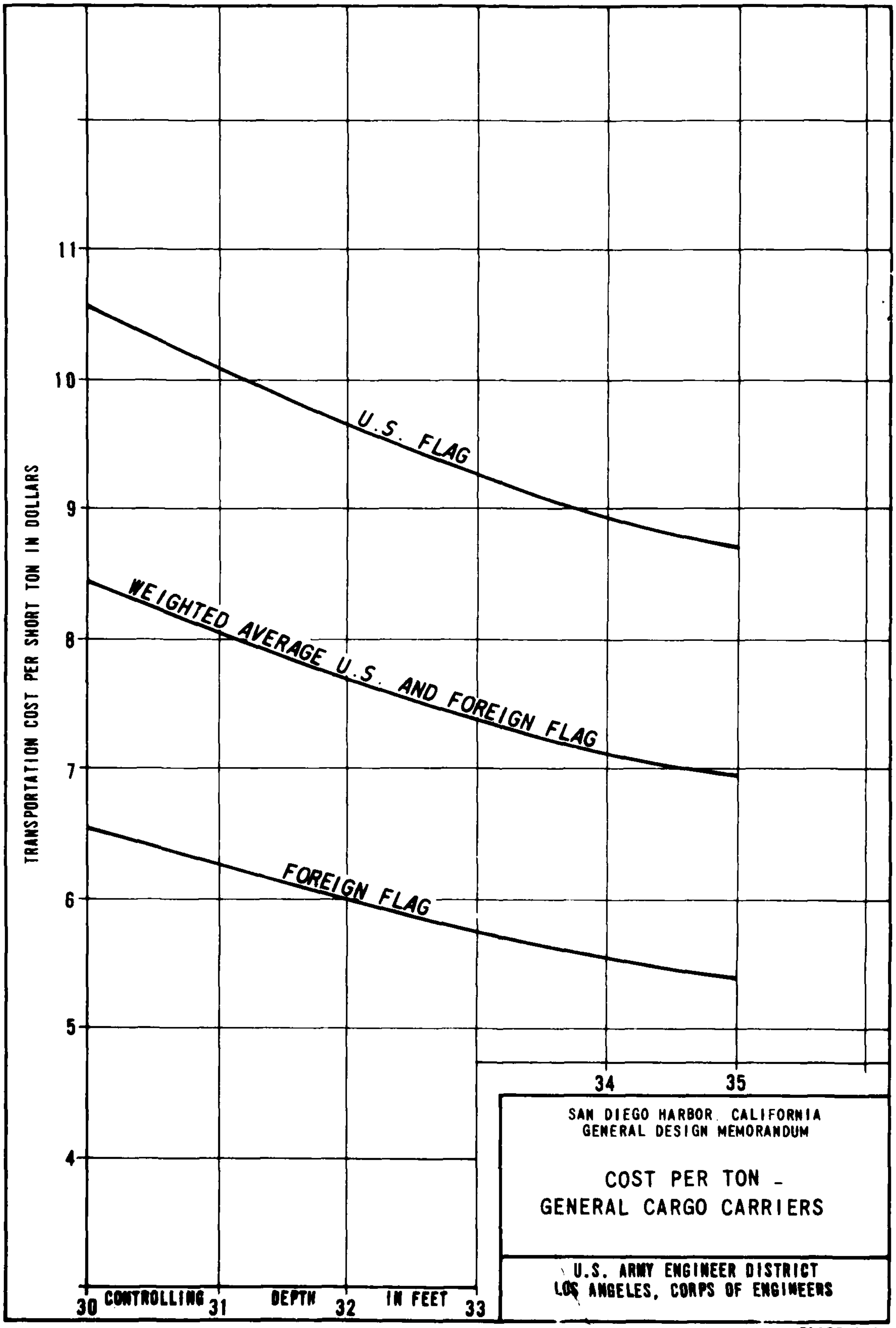

TRANSPORTATION COST PER SHORT TON IN DOLLARS
4
3
2
1
U.S. FLAG
WEIGHTED AVERAGE U.S. AND FOREIGN FLAG
FOREIGN FLAG
30 CONTROLLING DEPTH 35 IN FEET
40
45
SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM
COST PER TON -
BULK CARRIERS
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

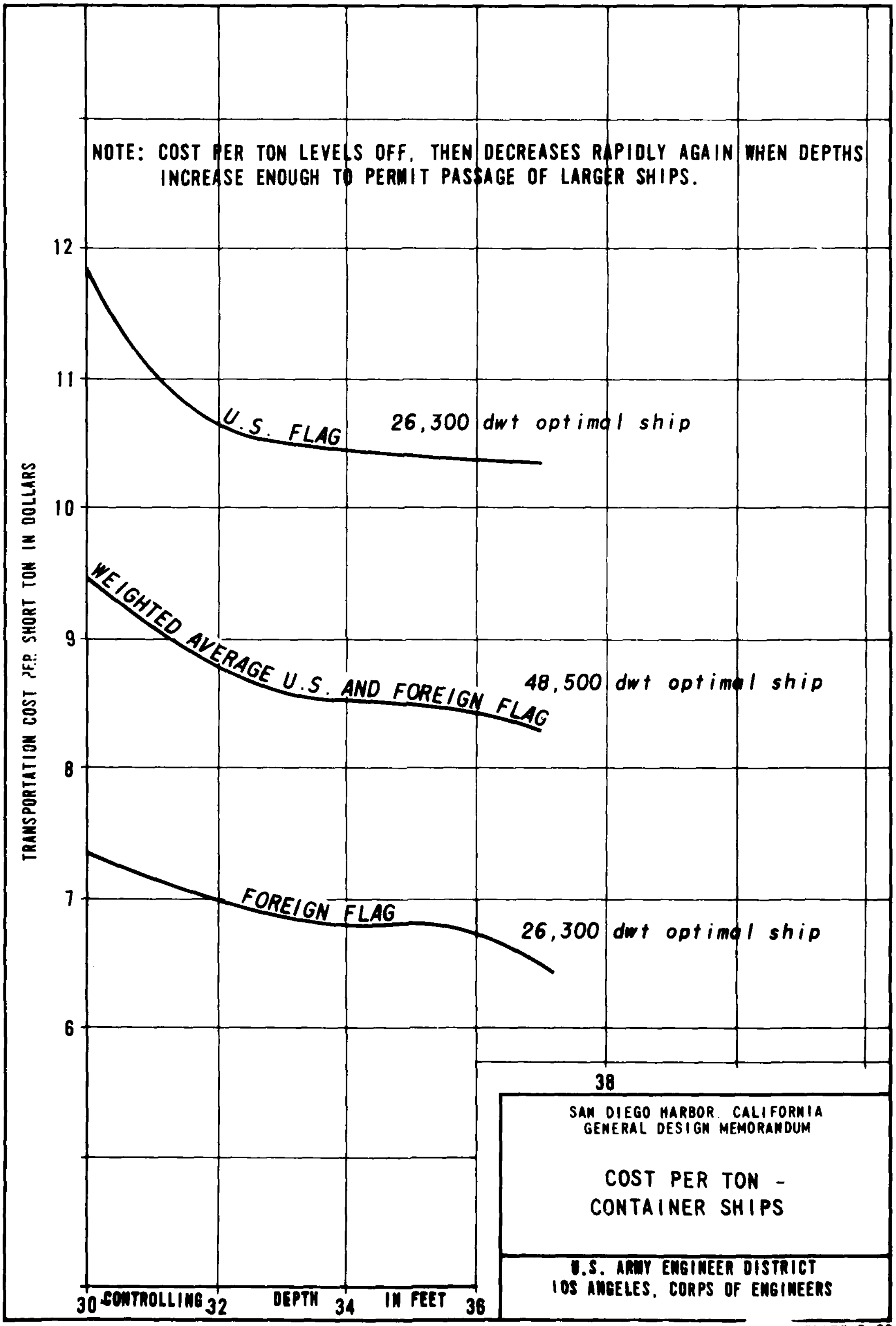
PLATE 5-2A




SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

COST PER TON -
GENERAL CARGO CARRIERS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

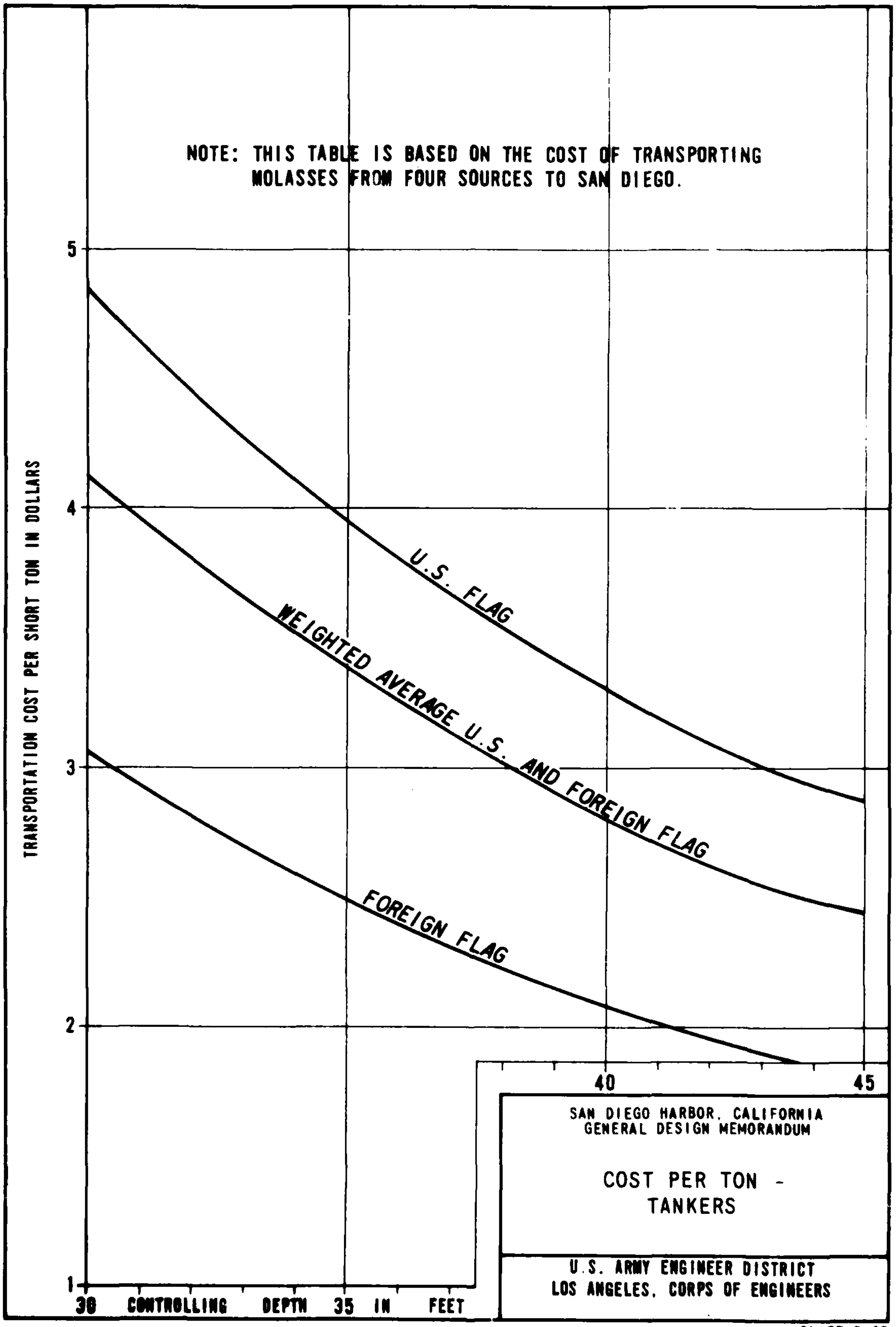



SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

COST PER TON -
CONTAINER SHIPS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

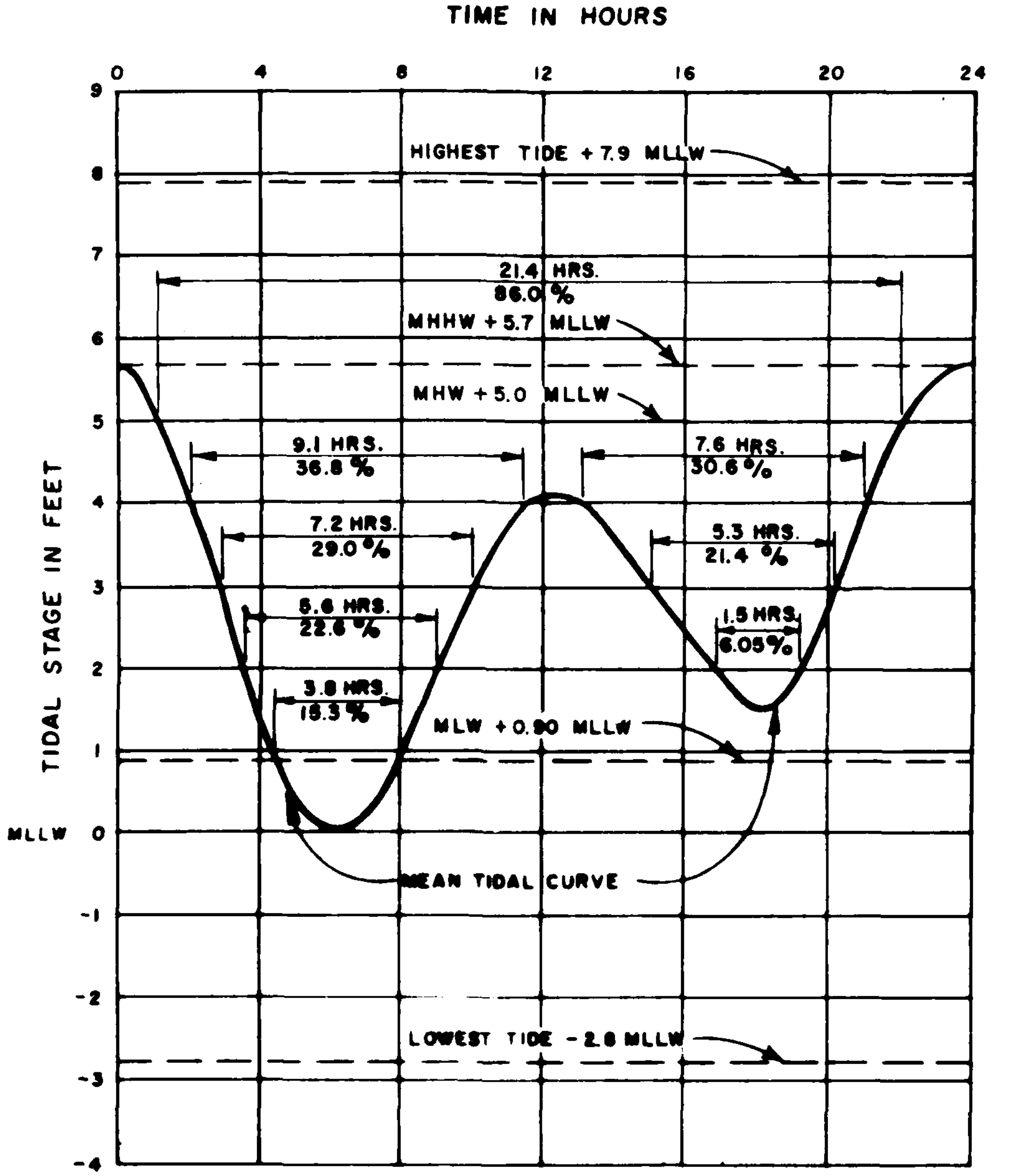
PLATE 5-2C




SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

COST PER TON - TANKERS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS




SAN DIEGO HARBOR, CALIFORNIA
GENERAL DESIGN MEMORANDUM

VESSEL WAITING TIME
SAN DIEGO HARBOR

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

# APPENDIX 6

## RESOLUTION OF LOCAL COOPERATION

SAN DIEGO HARBOR,
CALIFORNIA

# APPENDIX 6

## RESOLUTION OF LOCAL COOPERATION

## SAN DIEGO HARBOR, CALIFORNIA

CONTENTS

Resolution of the San Diego Unified Port District Furnishing Assurances of Local Cooperation in Connection with Navigation Channel Improvements

RESOLUTION 74-17

WHEREAS, the Committee on Public Works of the United States Senate, 85th Congress, on 13 August 1958, adopted a resolution requesting a review of the report of the Chief of Engineers on San Diego Harbor, California, printed in House of Representatives Rivers and Harbors Committee Document No. 89, 74th Congress, 2nd Session, and other pertinent reports with a view to determining whether the existing projects should be modified in any way at the present time; and

WHEREAS, the construction of the modified project for San Diego Harbor was authorized by the act of Congress approved 13 August 1968, Public Law 90-483, 90th Congress, 2nd Session, in accordance with the plans and subject to the conditions as set forth in House Document No. 365, 90th Congress, 2nd Session; and

WHEREAS, it is the policy of the United States to undertake the improvements of a deep draft harbor only in cooperation with the properly constituted public body having ability and authority to cooperate financially and to operate essential facilities, and it is also the policy of the United States to require such public body to provide certain items of local cooperation, NOW, THEREFORE,

BE IT RESOLVED by the Board of Port Commissioners of the San Diego Unified Port District, San Diego, California, as follows:

That the San Diego Unified Port District assures the Secretary of the Army that it will provide local cooperation for construction of the plan of improvement for the improvement of the existing navigation features of San Diego Harbor as follows:

a. Contribute in cash 4.1 per cent of the first cost of dredging, exclusive of the cost of spoil-retaining works, presently estimated at $417,000, such contribution to be made in a lump sum prior to construction;

b. Provide without cost to the United States, all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also provide necessary retaining dikes, bulkheads, and embankments therefore or the costs of such retaining works;

c. Hold and save the United States free from damages that may result from the construction and maintenance of the project;

d. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms;

e. Provide and maintain without cost to the United States depths in berthing areas and local access channels serving the terminals commensurate with depths provided in the related project areas;

f. Accomplish without cost to the United States such utility or other relocations or alterations as necessary for project purposes, except for such utilities as

are owned by the United States Navy; and

g. Establish regulations prohibiting discharge of pollutants into the waters of the harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control.

BE IT FURTHER RESOLVED that the Clerk of the Board of Port Commissioners be and is hereby directed to forward a certified copy of this resolution to the District Engineer, United States Army Engineer District, P. O. Box 2711, Los Angeles, California 90053.

ADOPTED this 29th day of January, 1974.

Presented By: DON L. NAY, Port Director

By ______________________
ASSISTANT PORT DIRECTOR

Approved: JOSEPH D. PATELLO, Port Attorney

______________________

I HEREBY CERTIFY that the above and foregoing is a full, true and correct copy of ~~Ordinance~~/Resolution No. 74-17 passed and adopted by the Board of Port Commissioners of the San Diego Unified Port District on 29 January 1974.

WILL[illegible] R. [illegible], Clerk
San Diego Unified Port District

By ______________________
Deputy Clerk

Date 30 January 1974

sw 1/29/74

# APPENDIX 7

## COORDINATION WITH OTHERS

## SAN DIEGO HARBOR, CALIFORNIA

## APPENDIX 7

## COORDINATION WITH OTHERS
## SAN DIEGO HARBOR, CALIFORNIA

### TABLE OF CONTENTS

## COORDINATION WITH OTHERS
## SAN DIEGO HARBOR, CALIFORNIA

1. Coordination with other agencies.

a. General. Throughout the study, the U.S. Army Engineer District, Los Angeles, maintained coordination with the following agencies:

U.S. Navy
U.S. Coast Guard
U.S. Bureau of Sport Fisheries and Wildlife (BSF and W)
U.S. National Marine Fisheries Service (USNMFS)
Environmental Protection Agency (EPA)
California Department of Fish and Game (Cal. F and G)
California Regional Water Quality Control Board,
San Diego Region (CRWQCB, SDR)
California State Lands Commission (Cal. L.C.)
California Department of Parks and Recreation (Cal. P and R)
City of Imperial Beach
City of Coronado
San Diego County Comprehensive Planning Organization
San Diego Unified Port District (SDUPD)
San Diego Gas and Electric Company (SDG and E Co.)
Western Union
California American Water Company
Pacific Telephone Company

b. U.S. National Marine Fisheries Service. The passage of the Environmental Control Act of 1970, the establishment of Council of Environmental Quality, passage of other legislative acts, and the special concern of many public and private organizations with the disposal of dredged materials (non of which had surfaced when the project was authorized), required close and continuous coordination with the above agencies and others throughout the preparation of this memorandum. They were primarily concerned with the resulting effects from the disposal of the dredged materials. The Bureau of Sport Fisheries and Wildlife, the National Marine Fisheeries Service, and the California Department of Fish and Game were primarily concerned with the effect disposal would have on the marine environment. As a matter of policy, the Bureau of Sport Fisheries and Wildlife opposes the placement of any fill within the bay unless that fill is utilized for a water-oriented activity. They are supported in this position by the California Department of Fish and Game. The E.P.A. was primarily concerned with whether the dredged material was polluted. Samples were taken from the bay and analysed in both the E.P.A. laboratory in Alameda, California, and the S.P.D. laboratory in Sausalito, California. The California Regional Water Quality Control Board, San Diego Region, was primarily concerned with the effect the waste discharge from the disposal of dredged materials would have on the bay and ocean waters.

c. U.S. Navy. Close and continuous coordination was maintained with the U.S. Navy in connection with the relocation of their utilities and the disposal of dredged materials on Navy held beaches.

(1) Utilities. The Navy has one sewerline and two waterlines crossing the bay from San Diego to North Island which have to be relocated because of the channel deepening. Initially, the Navy requested, because of budget limitations, that the funding for the relocation be included under the Corps of Engineers construction contract. Subsequently, the Navy successfully negotiated with and obtained space in a new sewerline constructed across the bay by the City of Coronado, thus eliminating the Navy's need to relocate their sewerline. Present schedules permit the Navy to remove existingsewerline and waterlines and to construct a new waterline.

(2) Disposal of dredged materials. Disposal of dredged materials from the channel deepening on the ocean beach opposite the U.S. Naval Amphibious Base and on the bayward beach of the Silver Strand, south of the U.S. Naval Amphibious Base, had to be coordinated with the U.S. Navy. The ocean beach opposite the Naval Amphibious Base is used for Naval Amphibious training operations. Plans were developed and coordinated to insure that disposal on the ocean beach would not detract nor interfere with amphibious training operations. Disposal on the bayward side of the bay, south of the amphibious base, were also coordinated with the Navy since they owned the land adjacent to where dredged materials would be placed. The newly-created land would accrue to the Navy.

d. U.S. Coast Guard. Coordination was maintained with the Coast Guard in connection with: (a) aids to navigation required by the authorized project; and (b) publication of our activities in the notice to mariners whenever any work in the bay was necessitated in connection with the preparation of this memorandum.

e. California American Water Company, San Diego Gas and Electric Company, Pacific Telephone Company and Western Union. Each of these companies had public utilities crossing the bay which required either removal or relocation, thus requiring the coordination of their plans with the dredging plan.

f. California Department of Parks and Recreation. The California Department of Parks and Recreation operates the Silver Strand State Park just south of the proposed disposal site on the ocean beach opposite the Naval Amphibious Base. This park provides facilities for parking, picnics, and ocean swimming. Since this agency is quite concerned with any disposal on the ocean beach near this park, it was necessary to coordinate disposal plans with them.

g. California State Lands Commission. The ocean beach upon which dredged materials are to be deposited comes under the jurisdiction of the California State Lands Commission and is leased to the U.S. Navy under a long-term agreement. Thus coordination with the California State Lands Commission was necessary.

h. San Diego County Comprehensive Planning Commission. This agency has been established to review development plans for projects in the San Diego area; therefore, plans for development of the project were coordinated with this group.

i. City of Coronado. Due to its location, actions taken in conjunction with the project can have a present or future effect on the City of Coronado. Thus, coordination had to be accomplished with the City of Coronado.

j. City of Imperial Beach. The city of Imperial Beach desired that dredged materials from this project be placed on Imperial Beach to provide beach nourishment to a presently eroded beach. Placement of materials at this location was highly desirable since it would provide a source of beach nourishment for the ocean beach from the mouth of the Tijuana River to Zuniga Jetty. The stretch of beach from the mouth of the Tijuana River to Zuniga Jetty makes up the Silver Strand littoral cell. Since the predominate littoral transport direction for the cell is northerly, materials placed on Imperial Beach near the mouth of the Tijuana River would provide nourishment to the entire Silver Strand. Early in the preparation of this general design memorandum, the mayor of Imperial Beach requested we place a considerable portion of the dredged material from the project on Imperial Beach, thus necessitating our coordination with the city of Imperial Beach.

k. The San Diego Unified Port District. Close and continuous coordination was maintained with this agency throughout the entire preparation of this general design memorandum. The San Diego Unified Port District, representing local interests for this project, are responsible for providing disposal areas, relocation of utilities, and other items required of local interests. Thus plans, surveys, relocations, coordination with other agencies, practically all of the actions taken in the preparation of this general design memorandum, were coordinated with the San Diego Unified Port District.

2. Meetings and conferences held with other agencies. Given below in chronological order is a list of the most important meetings held with other Federal agencies, State agencies, and local entities during the preparation of this memorandum:

a. 28 July 1970: Meeting in San Diego with representatives of the U.S. Navy to discuss relocations of Navy utilities and disposal of dredged materials on Navy property.

b. 29 July 1970: Meeting in San Diego with representatives of SDUPD concerning disposal of dredged materials within or adjacent to San Diego Bay.

c. 1 October 1970: Meeting in San Diego with representatives of the U.S. Navy, SDG and E Co., Pacific Telephone Co., California-American Water Company, City of Coronado, and SDUPD to discuss relocation of public and Navy utilities crossing the bay.

d. 22 October 1970: Meeting with representative of Scripps Institute of Oceanography to discuss disposal of dredged material on Ocean beach.

e. 3 December 1970: Meeting in San Diego with representatives of the U.S. Navy to discuss replacement and removal of Navy owned subaqueous utility lines.

f. 28 January 1971: Meeting in San Diego with representatives of SDUPD to discuss revision of the port district master plan.

g. 28 April 1971: Meeting in San Diego with representatives of E.P.A. and SDUPD relative to obtaining samples of material to be dredged from channel for chemical analysis by E.P.A.

h. 29 April 1971: Meeting in San Diego with representatives of the SDG and E Co., Pacific Telephone Company, and the SDUPD to discuss utility relocations across San Diego Bay.

i. 3 June 1971: Meeting in Los Angeles with Vice President of Pacific Far East Lines to discuss LASH system and its possible use in San Diego Harbor.

j. 30 June 1971: Meeting in San Diego with members of the SDUPD concerning economic studies and projections for the project.

k. 4 June 1971: Meeting in San Diego with representatives of the SDUPD, CRWQCB, SDR, and the Cal. F and G to discuss the environmental impact statement for the project.

l. 22 Sept. 1971: Meeting in San Diego with representative of SDG & E Co. and SDUPD to discuss trans bay utility relocations.

m. 28 Sept. 1971: Meeting in San Francisco with representatives of the E.P.A. concerning their analysis of sediment samples from San Diego Harbor.

n. 21 Oct. 1971: Meeting in Los Angeles with representatives of Cal. F & G, CRWQCB, SDR, BSF & WL, and SDUPD to discuss the results of the sediment analysis by EPA.

o. 18 Nov. 1971: Meeting in Los Angeles with representatives of the BSF & WL, EPA, Cal. F & G, CRWQCB, SDR, and SDUPD relative to testing and analysis of materials to be dredged from harbor.

p. 12 Jan. 1972: Meeting in Los Angeles with representatives of California-American Water Company concerning the removal of their utilities from the bay.

q. 17 Jan. 1972: Meeting in Los Angeles with representatives of the Cal. F & G to discuss disposal of the dredged materials.

r. 9 Feb. 1972: Meeting in Los Angeles with representatives of BSF & WL, EPA, Cal. F & G, CRWQCB, SDR, and SDUPD to discuss disposal methods for dredged materials from the channel deepening project.

s. 15 Feb. 1972: Meeting in San Diego with representatives of CRWQCB, SDR, and SDUPD to discuss waste discharge procedures.

t. 7 June 1972: Meeting in San Diego with representatives of CRWQCB, SDR, and SDUPD to discuss disposal of dredged materials.

u. 28 June 1972: Meeting in San Diego with representatives of U.S. Navy and SDUPD to discuss disposal of dredged materials on ocean beach used by the Navy for amphibious training operation.

v. 26 July 1972: Meeting in San Diego with representatives of the Navy and the CRWQCB, SDR concerning additional testing for use of offshore disposal areas.

w. 9 Aug. 1972: Meeting in San Diego with representatives of SDUPD relative to dike construction.

x. 24 Aug. 1972: Meeting in San Diego with representatives of the U.S. Navy to discuss disposal of dredged materials on ocean beach.

y. 28 Aug. 1972: Meeting in San Diego with representatives of the CRWQCB, SDR to discuss plans for dredging the channel and disposing of the materials.

z. 21 Sept. 1972: Meeting in San Diego with representatives of SDUPD concerning disposal sites.

aa. 9 Nov. 1972: Meeting in Los Angeles with representatives of EPA and CRWQCB, SDR concerning EPA's criteria for determining polluted dredged materials.

bb. 14 Nov. 1972: Meeting in San Diego with representatives of SDUPD to discuss alternate plans for accomplishing the project.

cc. 6 Dec. 1972: Meeting in San Diego with representatives of the U.S. Navy, BSF & WL, SDUPD, and the city of Coronado to discuss plans for disposing of material on the ocean beach and south of the Naval Amphibious Base.

dd. 30 Jan. 1973: Meeting in San Diego with representatives of SDG & E Co. to discuss relocation of their utilities.

ee. 30 Jan. 1973: Meeting in San Diego with representatives of the SDUPD to discuss dredging procedures.

ff. 15 March 1973: Meeting in Los Angeles with representatives of EPA to discuss EPA's revised criteria for determining suitability of dredged materials.

gg. 23 March 1973: Meeting in Los Angeles with representatives of the U.S. Navy to discuss dredging plans.

hh. 11 April 1973: Meeting in San Diego with representatives of the SDUPD relative to cost sharing of the project.

ii. 8 May 1973: Meeting in San Diego with representatives of SDUPD and Cal. P & R to discuss disposal of dredged materials on ocean beach.

jj. 8 May 1973: Meeting in San Diego with representatives of the San Diego County Comprehensive Planning Organization relative to disposal plans for project.

kk. 14 May 1973: Meeting in San Diego with representatives of the SDUPD to discuss cost sharing for project.

ll. 22 June 1973: Meeting in Sacramento with representatives of the BSF & W and the Cal. F & G to discuss disposal of dredged materials and the environmental aspects of disposal of materials in San Diego Bay.

mm. 22 August 1973. Public meeting in National City (see App. 9).

nn. 8 Jan. 1974. Meeting in Portland with Regional Director of the BSF&W to discuss disposal of dredged materials and the environmental aspects of disposal of materials in San Diego Bay.

oo. 5 April 1974. Meeting in San Diego with representatives of the SDUPD to discuss plan for accomplishing project.

pp. 8 May 1974. Meeting in San Diego with representatives of the U.S. Navy to discuss disposal of dredged materials in the area south of the Naval Amphibious base on the bay side of the Silver Strand.

qq. 16 May 1974. Meeting in San Diego with representatives of the SDUPD to discuss the plan for accomplishing construction of the project.

rr. 1 Aug. 1974. Meeting in Sacramento with representatives of the State of California to discuss the disposal of dredge spoil on the bayward side of the Silver Strand south of the Naval Amphibious base.

ss. 22 Aug. 1974. Meeting in San Diego with representatives of U.S. Navy, BSF&W, USNMFS, and Cal. F and G to discuss disposal of dredge fill on bayward side of Silver Strand south of Naval Amphibious base.

tt. Follow up conference held on 26 Sep. 1974 at Naval Amphibious base. Subject discussed and agencies represented were the same as described in reference ss.

uu. Conference held on 8 Nov. 1974 with representatives of the U.S. National Marine Fisheries Service, Bureau of Sport Fisheries and Wildlife, California Department of Fish and Game and the Corps of Engineers at the Long Beach office of the Department of Fish and Game to discuss disposal of dredge spoil on bayward side of the Silver Strand.

vv. Conference held on 11 Dec. 1974 with representatives of U.S. Navy to discuss disposal of dredge spoil on bayward side of Silver Strand.

3. Comments received to this design memorandum.

CE letter concerning disposal of dredge spoil, 7 January 1972
BSF&W letter concerning disposal of dredge spoil, 29 March 1972
U.S. Navy letter concerning dredge disposal plans, 7 November 1972
CE letter concerning disposal of dredged material, 26 January 1973
CE letter concerning disposal of dredged material, 26 January 1973
California F&G letter concerning disposal of dredged material, 23 February 1973
BSF&W letter concerning disposal of dredged material, 23 February 1973
EPA letter concerning ocean disposal of dredged material, 23 July 1973
CE letter concerning dredge spoil disposal, 24 August 1973
USNMFS letter concerning dredge spoil disposal areas, 11 September 1973
CE letter concerning proposed disposal sites, 5 February 1974
BSF&W letter concerning proposed disposal sites, 26 March 1974
SDUPD letter concerning turning basin revision, 15 April 1974
USCG letter concerning EIS, 17 May 1974
SD Gas & Electric letter concerning relocation, 22 May 1974
SDUPD letter concerning Fifth Avenue fill site, 24 May 1974
SDUPD letter concerning draft EIS and GDM, 6 June 1974
CE letter concerning Fifth Avenue fill site, 7 June 1974
U.S. Navy letter concerning disposal of dredge spoil, 24 June 1974
EPA letter concerning dredge spoil, 8 July 1974
BSF&W letter concerning disposal of dredged material, 9 July 1974
California Resources Agency letter concerning dredge disposal, 9 July 1974
EPA letter concerning disposal of dredged material, 21 August 1974
CRQCBSD letter concerning discharge of dredge spoil, 17 December 1974
U.S. Navy letter concerning dredge disposal, 6 January 1975
BSF&W letter concerning disposal of dredged material, 29 January 1975

RETYPED FOR REPRODUCTION

SPLED-EN 7 January 1972

Mr. Norman R. Chupp
Field Supervisor
Bureau of Sport Fisheries and Wildlife
U.S. Department of the Interior
2800 Cottage Way, Room E2727
Sacramento, California 95825

Dear Mr. Chupp:

Reference is made to telephone conversation between Mr. Bill Hoeft of your office and Messrs. Sam Ackerman and Frank Buchholz of this office concerning disposal of dredge spoil from the San Diego Channel Deepening Project authorized by Public Law 90-483. The three drawings, which were discussed in referenced conversation, are being inclosed for Mr. Hoeft's review.

In line with the discussion with Mr. Hoeft, we would appreciate receiving your comments concerning the Bureau of Sport Fisheries and Wildlife's policy concerning disposal of contaminated dredge material. Your suggestions regarding the disposal of dredge spoil for this project would serve as the basis for an alternative disposal plan to that indicated on the inclosed drawing, entitled, "General Plan and Cross Sections of Fill Areas."

Your assistance in this matter is appreciated.

Sincerely yours,

EDWARD KOEHM
Chief, Engineering Division

3 Incl
1. General Plan and Cross Sections of Fill Areas
2. Plan of Exploration and Logs of Test Holes
3. Logs of Test Holes

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
**BUREAU OF SPORT FISHERIES AND WILDLIFE**

1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

Reference: RB

Your reference:
SPLED-EN
January 7, 1972

March 29, 1972

District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

This is in reply to Mr. Koehm's letter concerning our policies regarding disposal of contaminated dredge materials as relates to your San Diego Channel deepening project.

The Bureau of Sport Fisheries and Wildlife maintains that contaminated spoil materials exceeding Environmental Protection Agency criteria standards (as outlined in "The Effects of Dredging on Water Quality in the Northwest," Appendix A, July 1971) should be removed from the navigable waters of the United States and disposed of on dry land disposal sites. This is in keeping with recommendations of the Council on Environmental Quality as set forth in their report to the President, dated October 1970. As you know, the President has endorsed the Council's recommendations.

We recognize that dry land disposal sites are not always available within a reasonable distance of project operations. We also realize that development of other acceptable processing and disposal methods will take time. Therefore, when it is demonstrated that dry land disposal is not feasible, the Bureau will accept, as a reasonable alternative, ocean disposal of contaminated spoil in waters no less than 100 fathoms deep. In-bay disposal behind dikes may be considered under carefully selected situations. However, this method conflicts with our policies regarding filling in bays and estuaries and is not in keeping with our efforts to protect and enhance the renewability of aquatic resources. The Bureau of Sport Fisheries and Wildlife is generally opposed to all filling of bays, estuaries, tidelands, marshes, or other shallow coastal waters, especially when alternative disposal areas are available. We are specifically opposed to filling for purposes not requiring on-the-water location; for purposes not considered to be in the interest of the general public; and/or where fish and/or wildlife losses will occur or their support systems will be degraded.

San Diego Harbor

2

In reference to our positions on your San Diego Channel improvement project, several elements of your present plans are of concern to us. The Bureau opposes filling of any type in the disposal site located adjacent to the mouth of the Sweetwater River. This site is identified as dredge disposal site "D" on your preliminary "General Plan and Cross Sections of Fill Areas." No drawing number is given. The mud and tidal flats in this location are important feeding areas for the many shorebirds that use the Sweetwater Marsh for nesting and resting. Several of these shorebirds are included on the Secretary of the Interior's list of endangered species.

In addition, we are currently in opposition to spoiling in dredge disposal site "B". To our knowledge, uses planned of this fill would not be water-related; therefore, we believe spoiling in this area would constitute filling of navigable waters and resultant losses of fish and wildlife habitat for purposes not requiring waterfront location.

The intended use of dredge site "A" has not yet been fully outlined by the San Diego Unified Port District. We therefore reserve comment on that site until the Port District provides more information on the purpose of the fill.

Disposal of material on the Silver Strand Beach (dredge disposal site "C") would be acceptable provided spoil materials are not contaminated and are comparable to the material found on the site. For example, we do not want bay muds deposited on the beach and in the surf zone.

In summary, we believe that dry land disposal is by far the best method of disposing of contaminated spoil material. However, when dry land disposal sites are not available, we believe that open ocean disposal in depths of 100 fathoms or more should be considered as the best alternative. In-bay disposal of contaminated or noncontaminated materials behind retainer dikes should be considered only when the purpose of such a fill has been determined to be related to an appropriate water-requiring or shoreline use, in the best interest of the general public, and of minimal impact on fish and wildlife resources and their support systems. Ocean disposal of noncontaminated spoils is acceptable provided disposal is accomplished in a manner and at a location that will cause minimal damages to fish and wildlife. In most cases, a monitoring program will be requested to assess the environmental impact. On-the-beach disposal of uncontaminated materials is acceptable provided the materials are of comparable quality to that of the receiving beach, and provided that the timing of disposal is such to minimize the impact on fish and wildlife.

Thank you for the opportunity to further state our concern regarding the disposal of contaminated waste anticipated during the construction of the San Diego Bay Channel deepening project. If you desire additional information, do not hesitate to contact us.

Sincerely yours,

John D. Findley

JOHN D. FINDLAY
Regional Director

COMMANDANT
ELEVENTH NAVAL DISTRICT
SAN DIEGO, CALIFORNIA 92130

IN REPLY REFER TO:
11460
Ser 178/32
9 NOV 1972

From: Commandant Eleventh Naval District
To: District Engineer, Los Angeles District, Corps of Engineers

Subj: San Diego Harbor Channel Deepening Project; Proposed Deposit of Soil at the Naval Amphibious Base, Coronado

Encl: (1) Dredge Disposal Plan for NAVPHIBASE Coronado
(2) Conditions for Deposit of Dredged Material
(3) Alternate Disposal Plan for NAVPHIBASE Coronado

1. Alternative dredge disposal plans for the San Diego Harbor Channel Deepening Project were discussed at a meeting held on 28 June 1972 at the San Diego Unified Port District offices. Because of the lack of other suitable deposit sites, the Navy was asked to reconsider its former objections to a proposal for deposit of 5.8 million cubic yards of dredged material along the ocean beach at the Naval Amphibious Base, Coronado. The Navy agreed to this, subject to provision of additional information to be furnished by the Corps of Engineers. Subsequently, two meetings have been held between representatives of the Commander, Amphibious Force, U. S. Pacific Fleet and the Corps of Engineers.

2. The Commander, Amphibious Force, U. S. Pacific Fleet, has endorsed a dredge disposal plan developed during the aforementioned meetings. The plan, which is furnished as enclosure (1), provides for 4.8 million cubic yards of material to be placed along Boat Lanes 1 through 10 at the ocean beach (Site 3), and the balance of approximately one million cubic yards to be placed on the bay side of the Silver Strand at Sites 1 and 2.

3. Deposit of dredge material at Site 1 will significantly improve the appearance of the southern shoreline of the Naval Amphibious Base, Coronado, peninsula and will provide needed additional land area and beachfront for recreational use by station personnel.

4. Deposit of dredge material at Site 2 will improve an area known as Boat Lane Delta (D), which is an operational training beach.

5. Deposit of dredge material at Site 3 can be accomplished without detriment to amphibious training requirements and is thus acceptable to the Navy. It should be noted, however, that the major portion of Site 3 is held in unrestricted leasehold from the State of California through November 12, 1985. A list of conditions applying to deposit at all sites, which is concurred in by the Unified Port District, is furnished as enclosure (2).

6. While the plan described in enclosure (1) will accommodate the needs of the Corps of Engineers and the Unified Port District, an alternative plan has been developed which merits consideration. The Naval Amphibious Base, Coronado, has experienced a considerable amount of unsolicited public use of the water area south of its peninsula, for boating and water-skiing, and of the adjacent shoreline, for parking, picnicing and camping. This creates a number of problems for the Navy, the City of Coronado, the recreational public and motorists on the Silver Strand Highway, as follows:

a. Naval Amphibious Base, Coronado: A portion of the Site 2 water-front area is known as Beach Lane Delta (D). Utilization of this beach lane is necessary to satisfy certain training requirements. This beach lane is often utilized by water-skiers, thereby presenting conflicts with scheduled amphibious training. In addition to conflicts of "joint use", there is a continuing problem of policing this area of trash, etc., discarded by the public.

b. City of Coronado: Although "Emergency Parking Only" signs have been placed along this area, the public generally ignores the signs. In addition, the City of Coronado does not permit overnight camping in this area; however, at times, the public attempts to remain overnight. Given the type of jurisdiction established for the majority of the area, it is the joint responsibility of the City of Coronado and the Naval Amphibious Base to prevent overnight camping.

11460
Ser 178/32
7 NOV 1972

Subj: San Diego Harbor Channel Deepening Project; Proposed Deposit of Soil at the Naval Amphibious Base, Coronado

c. The public: The area is not completely functional as a picnic or water-ski area. The land between the Strand Highway and the water is narrow and steep. No adequate parking area is available. Those who park adjacent to the Strand do so illegally and create a dangerous situation for themselves, their property, and other motorists.

d. Motorists: A dangerous condition exists whenever numerous cars, trucks, campers and trailers are parked immediately adjacent to the travelled portion of the Strand Highway.

Enclosure (3) depicts an alternate dredge disposal plan which would eliminate the above problem areas. A water recreation area is proposed in essentially the same area as presently used, but it would exclude Boat Lane Delta (D). The plan provides for extension and improvement of the bay-front parallel to Silver Strand Highway, including a parcel of land identified as Site 2A. This parcel has been filled through two previous dredging projects, but it is rendered unuseable due to insufficient elevation and surface compaction. A portion of Site 2A could be fenced to provide an area for parking at a safe distance from the Highway, thereby eliminating hazards to the recreational public and passing motorists. Eventually, this site could be developed to include boat ramps, picnic facilities and other assets which would contribute to a high-quality public recreational area.

7. This alternate plan would entail less fill on the ocean beach, and more fill on the bay front. It must also be stressed that, due to the fluctuating demands for Navy family housing and the potential emergence of new operational requirements, it would be necessary to retain all existing land in this area under fee ownership by the Navy. While joint use of recreational assets is endorsed as a highly desirable goal, public use of Navy land must of necessity be established on a temporary use basis, revocable at the sole option of the Navy.

8. The Navy is well aware of the City of Coronado's posture with respect to filling of the bay; however, the scheme presented in enclosure (3) can be shown to hold substantial benefits for Coronado and the greater metropolitan community as well. Although of no direct operational benefit to the Navy, this scheme would relieve the necessity of policing the "off-limits" areas of the bay front and would upgrade the quality of unimproved bay front land.

11460
Ser 178/32
2 NOV [illegible]

Subj: San Diego Harbor Channel Deepening Project; Proposed Deposit of Soil at the Naval Amphibious Base, Coronado

9. In summary, the dredge disposal plan shown on enclosure (1) is acceptable to the Navy. The alternate plan, shown on enclosure (3), is endorsed as a more functional solution, however, and should be presented for consideration by all interested parties. In view of the Navy's supportive role in the Harbor Improvement Project, it is believed that consideration of the alternative herein should be initiated by those most directly concerned. Specifically, it is suggested that the Corps of Engineers, in concert with the San Diego Unified Port District, hold a meeting to review and discuss the two plans with the City of Coronado and such other agencies as may be deemed appropriate.

J. W. Williams, Jr.
J. W. WILLIAMS, Jr.

Copy to: w/encl (1), (2), (3))
San Diego Unified Port District
COMPHIBPAC
COMPHIBOPSUPPAC
CO NAVPHIBASE San Diego
Dir San Diego Branch WESTNAVFACENGCOM
CO WESTNAVFACENGCOM

CONDITIONS FOR DEPOSIT OF DREDGED MATERIAL

1. Placement of dredged material: It was agreed that the dredged material will be placed on Sites 2 and 3 during the months of September to April only, during two consecutive years. From an operational standpoint this is necessary because of heavy training requirements during the May to August time frame. Placement of dredged material on Site 1 can be accomplished at any time.

2. Diking of dredged material: It will be required to dike the material to be placed on Site 1. This requirement results from the necessity to bring floating cranes close ashore to lift pontoon causeway sections into and out of the water for maintenance, inspection and repair. The Port District representative stated that the Port District would fund the diking of dredged material on Site 1. Material placed at Sites 2 and 3 need not be diked.

3. Unusable boat lanes: It was agreed that the placement of dredged material at Site 3 will not render unusable more than two beach lanes at any one time. This is a very important requirement to which strict adherence must be paid. The U. S. Army Corps of Engineers representatives stated that this requirement will be written into the contract specifications.

4. Dredge pipelines: It was agreed that the "header" pipeline from which material will flow to Site 3 will be placed parallel to the Strand highway in a location not to interfere with beach operations. This location will be specified in the contract as a location to be designated by the Commanding Officer, Naval Amphibious Base, Coronado. All "lateral" pipelines leading from the "header" to the deposit point will be adequately buried to permit landing craft retriever units and all other types of vehicles unobstructed access along the entire beachfront area.

5. Quality of dredged material: It was agreed that the dredged material placed on Sites 1, 2 and 3 will be essentially of the same consistency as that sand which now exists at Site 3. This is a very important requirement because it implies that excessive fines and contaminated material will not be present. Excessive fines and contaminated material result in cloudy, polluted water which would present unacceptable hazards to swimmers. Since a great deal of swimmer-type training is conducted at Sites 2 and 3, the dredged material must be free from excessive fines and pollutants. It was stated by the U. S. Army Corps of Engineers representative that all dredged material placed at the three sites will be a quality which will permit operating on the newly placed material within a 24-hour period. This is an important requirement because it will obviate extended settling periods and thereby not jeopardize the number of usable beach lanes required at all times.

INCL 1

6. Submerged gradient: It was agreed that the newly formed submerged gradient would approximate the existing submerged gradient. This requirement must be included within the contract specifications. The importance of this requirement stems from the importance of having to launch and recover small craft during and after certain beach training exercises.

7. Preparation of and exercise of control over contract specifications: It was agreed that the U. S. Army Corps of Engineers would solicit assistance from Naval Amphibious Base, Coronado personnel in preparing thos contract specifications which are required to ensure that items 1 through 6 above are clearly enumerated as contract requirements. In addition, it was agreed that the Commanding Officer, Naval Amphibious Base, Coronado can cause the U. S. Army Corps of Engineers to direct the dredge contractor to crease operations whenever the conditions set forth in items 1 through 6 above are not being complied with or whenever it is believed an unsafe condition is present.

RETYPED FOR REPRODUCTION

SPLED-CN 26 Januray 1973

Mr. Russ Ernest, Field Supervisor
Bureau of Sports Fisheries & Wildlife
2853 Pacific Coast Highway
Corona del Mar, California 92625

Dear Mr. Ernest:

Recent developments have necessitated formulation of a revised plan to accomplish the San Diego Harbor Channel Deepening Project, authorized by Public Law 98-483. Changes in this plan from the plan previously furnished your agency, involve disposal of an estimated 1,000,000 cubic yards of nonstructural material from the channel dredging between Miles 10.4 and 11.6, and the elimination of the Gloretta Bay fill site.

The inclosed plan is submitted for your review and comments. We would appreciate receiving your comments as soon as possible.

If additional information concerning the plan is required, you may contact Mr. Frank Buchholz, (213) 688-5403.

Sincerely yours,

1 Incl
As stated

JAMES Z. METALIOS
LTC, CE
Acting District Engineer

RETYPED FOR REPRODUCTION

SPLED-CN

26 January 1973

Regional Manager
California Department of Fish & Game
350 Golden Shore
Long Beach, California 90802

Dear Sir:

Recent developments have necessitated formulation of a revised plan to accomplish the San Diego Harbor Channel Deepening Project, authorized by Public Law 90-483. Changes in this plan from the plan previously furnished your agency, involve disposal of an estimated 1,000,000 cubic yards of nonstructural material from the channel dredging between Miles 10.4 and 11.6, and the elimination of the Glorietta Bay fill site.

The inclosed plan is submitted for your review and comments. We would appreciate receiving your comments as soon as possible.

If additional information concerning the plan is required, you may contact Mr. Frank Buchholz, (213) 688-5403.

Sincerely yours,

1 Incl
As stated

JAMES Z. METALIOS
LTC, CE
Acting District Engineer

'E OF CALIFORNIA—RESOURCES AGENCY RONALD REAGAN, Governor

PARTMENT OF FISH AND GAME
RINE RESOURCES REGION
0 Golden Shore
ng Beach, California 90802

23 February 1973

Colonel Harry McK. Roper, Jr.
District Engineer
Los Angeles District
U. S. Army Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Colonel Roper:

Your changes in the plan for San Diego Harbor Channel Deepening Project, included with your cover letter dated 26 January 1973, have been reviewed.

The plans to eliminate the Glorietta Bay Fill Site as a dredge disposal area will help maintain this area for use by fish and wildlife.

The Department of Fish and Game is concerned with several remaining portions of the subject plan. Of particular concern is the proposal to place approximately 453,000 cu. yds. of dredged material in the area south of the proposed Sweetwater Channel extension. This area is vital to the maintenance of numerous species of shorebirds, water fowl, and marsh birds. The Department therefore objects to the proposed fill in this area.

The proposed deposition of dredged material on the bay side of the Silver Strand would also adversely affect fish and wildlife resources. The increased slope of the intertidal area would decrease already critical habitat available to shorebirds and wading birds. This would also decrease the tidal prism and the area used by diving species of birds. Deposition of this material on the ocean side of Silver Strand would relieve our concern for loss of this area.

More information is necessary regarding the fill at Fifth Avenue and possible effects the fill may have on the flow pattern within the lower bay. We are concerned that this fill may affect the flow pattern and the tidal prism in the lower bay. We would appreciate any data you may have that would indicate no significant changes in flow will occur as a result of filling in this area.

The proposed deposition of material within a dredged hole located in the bay appears to present potential problems. We are concerned over the effect of diking at this location and removing this volume of water from the tidal prism may have in relation to tidal currents and tidal exchange. We are also concerned with potential problems associated with handling the dredged material. Specific points we would like to see discussed are: the efficiency of the sand dike in filtering spoil material without becoming plugged or without becoming liquified; the capability of the dredged material to support a 5-foot layer of sand; the length of time the dike would remain in place before the area was restored to its former depth.

For your information the present position of the Department of Fish and Game is that we object to any further filling of San Diego Bay pending implementation of a comprehensive development plan providing for all of the beneficial uses of the bay. Planning efforts, however, should continue keyed to the time when the master plan is implemented.

Sincerely,

Doyle E. Gates
Regional Manager

cc: ES, Sacto
ES, Region 5
R. Mall
B. Eliason
J. Carlisle, Jr.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

10-8151

Reference: RB

Your reference:
January 26, 1973

February 23, 1973

District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

This responds to Lieutenant Colonel Metalios' letter concerning the plan of spoil disposal for the proposed San Diego Harbor Channel Deepening project.

Our appraisal of ths disposal plan has led us to the following conclusions:

1. The disposal of 1,306,000 cubic yards from miles 6.0 to 8.6 to develop 22.04 acres of fill in the Fifth Avenue area cannot, in our opinion, be justified. Information provided by your agency indicates that the base of the fill would cover approximately 113 acres of bay bottom. In addition to the surface and bottom areas that would be degraded or lost from San Diego Bay, the tidal prism would be reduced and current patterns and velocities would probably be modified. The actual effects on these parameters are unknown, but the net result would probably be serious erosion in one area and shoaling in another. It is our understanding that the San Diego Unified Port District has not fully outlined the purpose of the proposed fill. We would oppose filling for a purpose that is not needed or is not water-oriented. We believe alternatives should be developed to dispose of this spoil.

2. The Bureau is opposed to use of fill area "C" immediately adjacent to the Naval Amphibious Base. The proposed fill area has one of the best ghost shrimp beds we have observed in San Diego Bay. Secondly, the area is of high value to shorebirds and migratory waterfowl, particularly black brant.

3. The Bureau will not oppose the deposition of spoil on the bay side of the Silver Strand in the Naval Amphibious landing area. However, material to be deposited must be similar to that already found on the site. Secondly, beach replenishment must be confined well north of the mudflats adjacent to the proposed park.

4. The Bureau is opposed to the fill area adjacent to the northern edge of the proposed park. The fill would be placed on a tidal flat that is of high value to invertebrates, especially cockles, common littleneck, purple, bent-nose, and California jackknife clams; and is heavily utilized by shorebirds.

5. A total of 5,265,000 cubic yards of material would be deposited on Silver Strand Beach. The Bureau will not oppose the deposition of dredge spoil upon this beach provided that spoil material is similar to that presently found on the site and is not contaminated. However, we recommend that spoiling occur during a period when the activity will not be damaging to fish resources or fishery of the area.

Important sport species caught along Silver Strand Beach include barred surfperch, California corbina, spotfin croaker, California halibut, and California grunion. Several of these species spawn during February through September in the nearshore waters of southern California. Juveniles of these species with spawning areas offshore move inshore in September. Therefore, the Bureau recommends that dredge material be placed upon the beach during the months of October through January.

6. It is proposed to deposit 453,000 cubic yards of spoil material from mile 12.9 to 13.2 at the proposed Sweetwater Improvement Site (D Street Fill Site). The surface area of the fill would cover 26.08 acres. Again, the tidal prism of San Diego Bay would be reduced by this fill.

The Sweetwater Marsh, which is adjacent to the proposed fill area, is the last major salt marsh (approximately 105 acres) remaining in San Diego Bay. The marsh provides resting and feeding areas for shorebirds, rails, herons, and some ducks. Of the 25 bird species known to breed in the south San Diego Bay area, three species, the least tern (Sterna albifrons), the clapper rail (Rallus longirostris), and the black rail (Laterallus jamaicensis), are listed as endangered by the Department of the Interior. Although the proposed fill area is a tidal mudflat and not in the Sweetwater Marsh, utilization of the area would, in our opinion, lead to the degradation or destruction of this valuable marsh.

It is our understanding that the San Diego Unified Port District has not fully outlined the purpose of the proposed fill. Therefore, the Bureau believes that dredging miles 12.9 to 13.2 and resultant filling of Sweetwater Improvement site should not be accomplished.

7. We have certain reservations regarding that part of Alternate E that calls for digging a hole in the bay and filling it with contaminated sediments, i.e., the "Glory Hole" concept. The Bureau would probably endorse such an endeavor on an experimental basis, but never when a million cubic yards of spoil is involved and so little information is available regarding the quality of materials to be removed from the hole, the quality of materials to be placed in the hole, how to barge through the dike, whether or not the sediments would support a sand cover, etc.

8. The Bureau will not oppose the deposition of uncontaminated sediments at the Imperial Beach Groin Field if the sediments are similar to those presently found at the site.

9. We note that sediments to come from mile 10.4 to 11.6 and destined for open ocean disposal are by EPA criteria polluted. The Bureau considers sample sites 3, 4, 5, 6, 7, 11, 12, 13 (miles 6.5 to 8.5 and 10.6 to 11.6) as polluted and, therefore, suitable for disposal in nonwetland areas behind suitably constructed dikes.

10. In view of our position regarding the subject fills, you may wish to reconsider the disposal in the bay of sediments from Alternate A(1).

You will find that our recommendations have remained essentially the same as submitted to you and your staff during various meetings and in my letter of March 29, 1972. For a greater in-depth review of Bureau dredge and fill policy, please refer to my March 29 letter.

I hope you fill find these comments helpful.

Sincerely yours,

John D. Findlay

JOHN D. FINDLAY
Regional Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Colonel Kenneth Roper
Department of the Army
Los Angeles District
Corps of Engineers
P.O. Box 271
Los Angeles CA 90053

JUL 23 1973

Dear Colonel Roper:

This is in response to Mr. Fuquay's letter of April 11 regarding the San Diego Harbor channel dredging project. We regret the delay in answering the inquiry, pending promulgation of interim ocean disposal criteria by EPA in the Federal Register on May 16, 1973.

We note that the ocean disposal site described for the disposal of the dredged material between Channel Mile 10.4 and 11.6 is listed as an approved interim dumping site in the EPA interim criteria. We have no objection to the use of this site for disposal of the material indicated, provided that concurrence is also obtained from the California Regional Water Quality Control Board, San Diego Region.

Sincerely,

Richard A. Coddington, Chief
Program Evaluation Branch
Air and Water Programs Division

cc: San Diego Regional Water Quality Control Board

MAR

RETYPED FOR REPRODUCTION

SPLED-CN 24 August 1973

Mr. John D. Findley
Regional Director
Bureau of Sport Fisheries and Wildlife
1500 North East Irving Street
P.O. Box 3737
Portland, Oregon 97208

Dear Mr. Findley:

Reference is made to your letter of 23 February 1973, in which you furnished us your appraisal of our disposal plan for the dredged material from San Diego Harbor Channel Deepending Project.

Your letter expressed general concern about the use and development of land and the reduction of the tidal prism from deposition of dredge spoil within San Diego Bay. The land created by the implementation of this project will be developed by the San Diego Unified Port District and the U.S. Navy. The San Diego Unified Port District, in their letter of 3 July 1973 to us, outlined in some detail the use and development of the land which would be created at 5th Avenue and "D" Street. A copy of this letter is furnished for your information.

Dredged material placed south of the Naval Amphibious Base will be placed on U.S. Naval property, and the land thus created would accrue to the Navy for development. The Navy plans to develop this land as follows:

a. The dredged material placed contiguous to the south boundary of the Naval Amphibious Base would be used to improve the area now used to assemble rafts and to create a usable beach fronting an enlisted men's service club to be constructed in the near future. (Photos #1 and 2).

b. The dredged material placed on the mud flat, which was created from dredge spoil from the Coronado Cay project, would be used to create a water-oriented recreational park for the general public. (Photos #3 and 4).

c. The dredged material placed on the bay side beach of the Silver Strand between the mud flat and the south boundary of the Naval Amphibious

Base would be used to restore an eroded beach and to improve its use for training Naval personnel in amphibious landing operations. (Photos #5 & 6).

You were correct in assuming that the tidal prism of the bay would be reduced. Our computations show that the tidal prism would be reduced as follows:

| | |
|---|---|
| 5th Avenue | 0.25% |
| "D" Street | 0.28% |
| Fill south of Naval Amphibious Base | 0.44% |
| Total | 0.97% |

This reduction in the tidal prism will reduce the tidal flow into and out of San Diego Harbor. However, we believe a reduction in the tidal prism of less than 1 percent is insignificant and will not result in any erosion in one area and shoaling in another in San Diego Bay.

The remainder of your letter contained specific comments. For clarity, I will answer them in the order in which they appeared in your letter. A copy of your letter of 23 February 1973 is inclosed for ready reference.

a. Para. (1) We are at a complete loss as to how anyone from our organization could have informed anyone from your organization that the base of fill at 5th Avenue covered 113 acres. Our calculations show the land area at the base of this fill be about 37.5 acres.

b. Para. (2) No comment.

c. Para. (3) The material to be dredged from the channel is similar to that found on the beaches. A foundation and material exploration was made in 1971 of the material to be dredged. Your field office in California was furnished the information we obtained from this exploration.

d. Para. (4) No comment.

e. Para. (5) (a) The comment made under c above is applicable.
(b) Our present plans call for disposal of dredged material on this beach between 15 September and 15 April.

f. Para. (6) No comment. See the development proposed by the San Diego Unified Port District in their 3 July 1973, attached as inclosure 1.

SPLED-CN 24 August 1973
Mr. John D. Findley

g. Para. (7) Alternate E, which called for digging a hole in the bay and filling it with nonstructural material, has now been eliminated from consideration. We now plan to dispose of the nonstructural material in the open ocean at a site approved by the Environmental Protection Agency.

h. Para. (8) No comment.

i. Para. (9) Over the past several years, the Environmental Protection Agency criteria for sampling and determining pollution of dredged materials has undergone considerable evolution and change. Dredged materials in San Diego Harbor, which EPA personnel may have once considered polluted, are no longer considered as such.

The sediments to be dredged were evaluated in terms of the EPA criteria of 1971. In May 1973, revised EPA interim criteria were issued. The 1973 criteria differ from the 1971 criteria in that the 1973 criteria do not present specific quantified criteria for water quality parameters. Under the 1973 criteria, dredged material is considered unpolluted if "...it produces a standard elutriate in which the concentration of no major constituent is more than 1.5 times the concentration of the same constituent in the water from the proposed disposal site used for the testing...Material which is determined to be unpolluted may be dumped at any site which has been approved for the dumping of settleable solid wastes of natural origin."

The data we have collected indicate that the material to be dredged would meet the 1973 criteria because the standard elutriate was far below the allowable 1.5-time concentration.

j. Para. (10) We now plan to dredge the materials from the north bay with a hopper dredge and to dispose of them in the open ocean at a site approved by Environmental Protection Agency.

We hope the above information will be of use to you in your further evaluation of our plans to dispose of the dredged material from the San Diego Channel Deepening project.

Your continued interest in our project is appreciated.

Sincerely yours,

5 Incl
As stated

JOHN V. FOLEY
COL, CE
District Engineer

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Region
300 South Ferry Street
Terminal Island, California 90731

5-5-01

September 11, 1973

Colonel John V. Foley
District Engineer
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Colonel Foley:

Subject: Proposed navigation improvement of San Diego Harbor, California

We have reviewed the project plan provided us by your office and have made onsite inspections of the proposed dredged spoil disposal areas. We have also reviewed the statements presented by other concerned resource agencies at the August 22, 1973 public meeting on the project.

The overall San Diego Harbor Channel deepening project might be environmentally acceptable were it not for the proposed use of the "D" Street and U.S. Navy Bayside fill areas outlined in Plan 1.

We commented on the use of a portion of the Navy Bayside fill area in our response to your Public Notice No. 25-73, dated May 1, 1973. In that response to your office, dated May 29, 1973 we stated "the subject notice proposes dumping the dredged spoil on a tidal flat adjacent to the southern edge of the Amphibious Base. Tidal flat areas, such as that proposed for the disposal site, are a valuable natural resource which should be preserved wherever possible. For that reason, we feel this permit should not be issued in its present form."

Since the date of our response on Public Notice No. 25-73, we have received more information regarding the existing environment at the Navy Bayside fill site. In addition to

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the value of the area as a tidal flat which supports a large invertebrate population, the California Department of Fish and Game has found eel grass beds along the bayside of the Silver Strand. Subtidal eel grass beds are known to provide excellent habitat for the breeding and developmental stages of numerous species of invertebrates and fish. Because of these factors, we do not feel that using the Navy Bayside area as a fill site would be wise from an environmental standpoint.

It is also doubtful that the use of the proposed "D" Street fill area would be environmentally sound. In April of this year, we reviewed a Draft Environmental Impact Statement (DEIS) prepared by your office on the Sweetwater River Channel and State Highway Route 54. The DEIS listed the aquatic organisms which the Sweetwater Marsh habitat adjacent to the "D" Street location supports. Though the lists were compiled from a single study done in September 1971, they indicated substantial populations of both vertebrates and invertebrates inhabited the marsh area. Because of the habitat value of this marsh area, we are concerned with the further deposition of spoil at the "D" Street site as planned. If the proposed new fill were to erode as the existing fill adjacent to the marsh has done, it could pose a threat to the ecosystem of the marsh itself.

Another major concern we have regarding the "D" Street proposal is the future industrial development which might occur once the fill was completed. Hopefully, this point will be thoroughly discussed in the EIS which is being prepared for the entire navigation improvement project.

We would also hope that before any final decisions are made regarding the project, some compromise disposal site alternatives could be agreed upon, which would alleviate the environmental problems we can foresee in the implementation of Plan 1.

We appreciate the opportunity to review this project during its planning stages.

Sincerely,

Gerald V. Howard
Regional Director

cc: William S. Leet, NMFS, Tiburon, CA
F34

RETYPED FOR REPRODUCTION

SPLDE

5 February 1974

Mr. R. K. Martinson
Regional Director
Bureau of Sport Fisheries and Wildlife
P.O. Box 3737
Portland, Oregon 97208

Dear Mr. Martinson:

As you know, my staff is currently formulating plans for modernizing the navigation features in San Diego Harbor, San Diego, California, pursuant to Public Law 90-483. Federal navigation projects require, as a consideration of local cooperation, that local interests furnish dredge spoil disposal areas. As the responsible local interest, the San Diego Unified Port District had formulated a plan for dredge spoil disposal on the margins of San Diego Bay at "D" Street, Fifth Avenue, and near the U. S. Naval Amphibious Base, as well as on the ocean beaches.

Responsive to the concerns of your organization, I directed my staff to reexamine the proposed fill sites from an engineering, economical and environmental posture. This reexamination, in relation to the sites listed above, follows:

a. "D" Street fill. Since spoil areas are a local responsibility, mitigation of potential impacts of the spoil areas also rests with the local interests. In recognition of this responsibility the San Diego Unified Port District explored acquisition of certain privately-owned lands in the Sweetwater Marsh with the intent of setting those lands as an ecological preserve in mitigation for the proposed "D" Street fill. Efforts to obtain these lands were unsuccessful. In view of the current ecological value of the Sweetwater Marsh, your agency's apprehension over the possible secondary impacts of the "D" Street fill on the marsh, and the need for improved navigation capabilities in the Bay, I shall not recommend the "D" Street site for dredge spoil disposal.

b. Fifth Avenue Fill. Your Corona del Mar field office requested specific information on the intended use of the Fifth Avenue fill (see photo, Incl 1). This inquiry concerned public use of the land, whether or not the use required a water front location and whether or not the land fill so created would adversely affect the tidal exchange in the bay. These questions were answered by our letter of 24 August 1973, and I believe your staff no longer opposes the creation of the Fifth Avenue fill.

c. Disposal at Navy Site. The land recommended for spoil disposal is owned by the U.S. Navy. It has suffered severe erosion, and much of the land is used for operations and training. The Navy has an urgent need to rehabilitate these areas. In previous discussions the Navy area has been treated as three distinct sites, and is so treated in the discussion below:

(1) Area Continguous to the South Boundary of the Naval Amphibious Base. The Navy would use dredge material here to repair serious erosion (see photo, Incl 2) and to improve the beach so that rafts can be assembled with greater ease and efficiency. Dredged material would also be used to create a usable beach to front an enlisted man's service club planned for construction in the interests of service morale. Creation of this fill is highly desirable if for no other reason than correction of a seriously eroding beach.

(2) Area on the Mudflat which was Created by Deposition of Dredge Spoil from the Coronado Cay Project. The Navy would use dredged material in this area (see photo, Incl 3) to create a water-oriented recreational park for the general public. Currently the general public interferes with the Navy's training mission on the bay side of the Silver Strand by picnicking on the beach and motor boating and water skiing in the amphibious training area. By providing facilities for public use in this area, the Navy hopes to relocate the general public from its training area to prevent further interference with the training mission. Creation of this fill is therefore highly desirable.

(3) Area on the Bay Side of the Silver Strand. Material placed on the bay side of the Silver Strand between the south boundary of the Naval Amphibious Base and the mudflats (see photos, Incl 4) would restore a badly eroded beach, and would improve its value for training Naval personnel in amphibious landing operations. This is the only area available to the Navy on the entire West Coast suitable for training in quiet water amphibious techniques. Placement of new material to restore the beach therefore is highly valuable.

SPLDE 5 February 1974

Mr. R. K. Martinson

In reviewing the history of the San Diego Harbor dredging project, I find that it was authorized by the previously-cited PL 90-483 on 13 August 1968. The authorizing legislation refers to the plans published in House Document 365, 90th Congress, 2d Session, dated 23 July 1968.

In this original authorization the project called for fills at Fifth Avenue, D Street, G Street, H Street, Glorietta Bay, and inshore and offshore of the Silver Strand. In further study we also gave consideration to using dredge spoil to build some artificial islands in the south bay, if they would be valuable as bird roosting areas.

Most of these fill areas have been given up in response to environmental and fish and wildlife interests.

Congress has appropriated money for dredging the harbor each year since FY 72, and the project has not yet been started because of the necessity of gaining concensus among concerned agencies on spoil disposal.

As a result of this District's most recent reexamination of spoil disposal sites, in recognition of the very real economic uses for the navigation improvements in the harbor, and in view of the valuable impacts on the Navy's defense mission which would result from the proposed fills along Navy shoreline, I feel I must soon go forward with a recommendation that the San Diego Harbor dredging project proceed, with spoil disposal sites at Fifth Avenue, three sites on Navy property in the vicinity of the Naval Amphibious Base, and on the Ocean side of the Silver Strand. I will assure close coordination between this District, your agency, and the Navy for scheduling of the placement of material in the surf zone along the Silver Strand to avoid untonable interference with fish spawning seasons and Navy training activities.

I assure you there has been a conscious effort on the part of my staff to accommodate as much as possible the concerns and desires expressed by your agency. I believe this plan is fully responsive to the requirements and philosophies of the National Environmental Policy Act of 1969 and the Fish and Wildlife Coordination Act, and is in the public interest.

Sincerely,

4 Incl
As stated

JOHN V. FOLEY
COL, CE
District Engineer

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

MAR 2 6 1974

18-01 San Diego Harbor

Reference: RB

Your reference:
SPLDE
Feb. 5, 1974

District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

This responds to your letter regarding proposed spoil disposal sites for the San Diego Bay Navigation project.

The Bureau of Sport Fisheries and Wildlife is not necessarily opposed to the Fifth Avenue fill. Mr. Nay's letter of July 30, 1973, gives a description of a proposed marina for this site. The stated objectives of this proposal appear to satisfy our criteria for being in the public interest and water dependent. However, we would like to see more detailed plans and drawings with descriptions of the anticipated shore and supportive facilities before we unconditionally remove our objection to this site.

We have no objections to disposal on the ocean beach of the Silver Strand as long as the deposition occurs between September 15 and January 30. Different species of fish, including the grunion, may use this area for spawning from February through September. Furthermore, we do not object to disposal on Imperial Beach.

Bureau biologists recently conducted a sampling survey of several of the disposal sites referred to in your letter. This survey substantiated the Bureau's earlier contention that valuable tidelands contiguous with, and south of the Naval Amphibious Base, would be lost if this area is filled.

The three naval sites are discussed separately.

1. Area contiguous to the south boundary of the Naval Amphibious Base - The Bureau is emphatically opposed to any filling on the Amphibious Base from an area of eelgrass beds in front of the EM service club to the

southwest end of the Naval housing area. High populations of mollusks, crustacea (especially ghost shrimp), polychaete worms, juvenile and forage fish were observed. The area was also used by shorebirds and black brant, the latter fed extensively in the adjoining eelgrass. Had the Navy not begun construction of the EM club on fill at the water's edge there would be no need to create a useable beach in this area. The existing rubble littered waterfront area, east of the EM club could be cleaned up as easily as creating a new beach, and without the environmental damage associated with the latter activity.

2. Area on the mudflat which was created by deposition of dredge spoil from the Coronado Cay project - This area is showing encouraging signs of recovery from the previous fill. Substantial young growth of eelgrass and *Salicornia*, and high populations of forage and juvenile fish, mollusks, and other invertebrates supports our belief that this area is repopulating. There was exceptionally high bird resting and feeding use of this area. Twenty-one species were identified and counted on March 6, 1974, including the black brant and the endangered brown pelican.

3. Area on the bay side of the Silver Strand - New growths of eelgrass and populations of mollusks and juvenile fish were found in this area. A degree of beach replenishment could occur provided strict limitations were placed on the magnitude and timing of such activities.

Our views on filling valuable sand and mudflats and the reduction of the tidal prism in San Diego Bay have been clearly stated in the past and have not significantly changed throughout the history of this project.

Unless the fills at locations (1) and (2) above are deleted, the Bureau has no choice but to oppose the Navigation Project.

We look forward to working with the Corps in protecting San Diego Bay's fish and wildlife for the good of all concerned.

Sincerely yours,

R. Kahler Martinson

R. Kahler Martinson
Regional Director

15/8-01

PORT OF SAN DIEGO
AND LINDBERGH FIELD AIR TERMINAL

3165 PACIFIC HIGHWAY • SAN DIEGO, CALIFORNIA
Telephone 291-3900 • Mailing Address: P. O. Box 488, San Diego 92112

April 15, 1974

District Engineer
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Sir:

Re: Navigation Improvement General Design Memorandum No. 1, San Diego Harbor; Turning Basin Revision

In connection with the Navigation Improvement General Design Memorandum No. 1 for San Diego Harbor, we would appreciate your consideration of a revision of turning basin design for National City Marine Terminal.

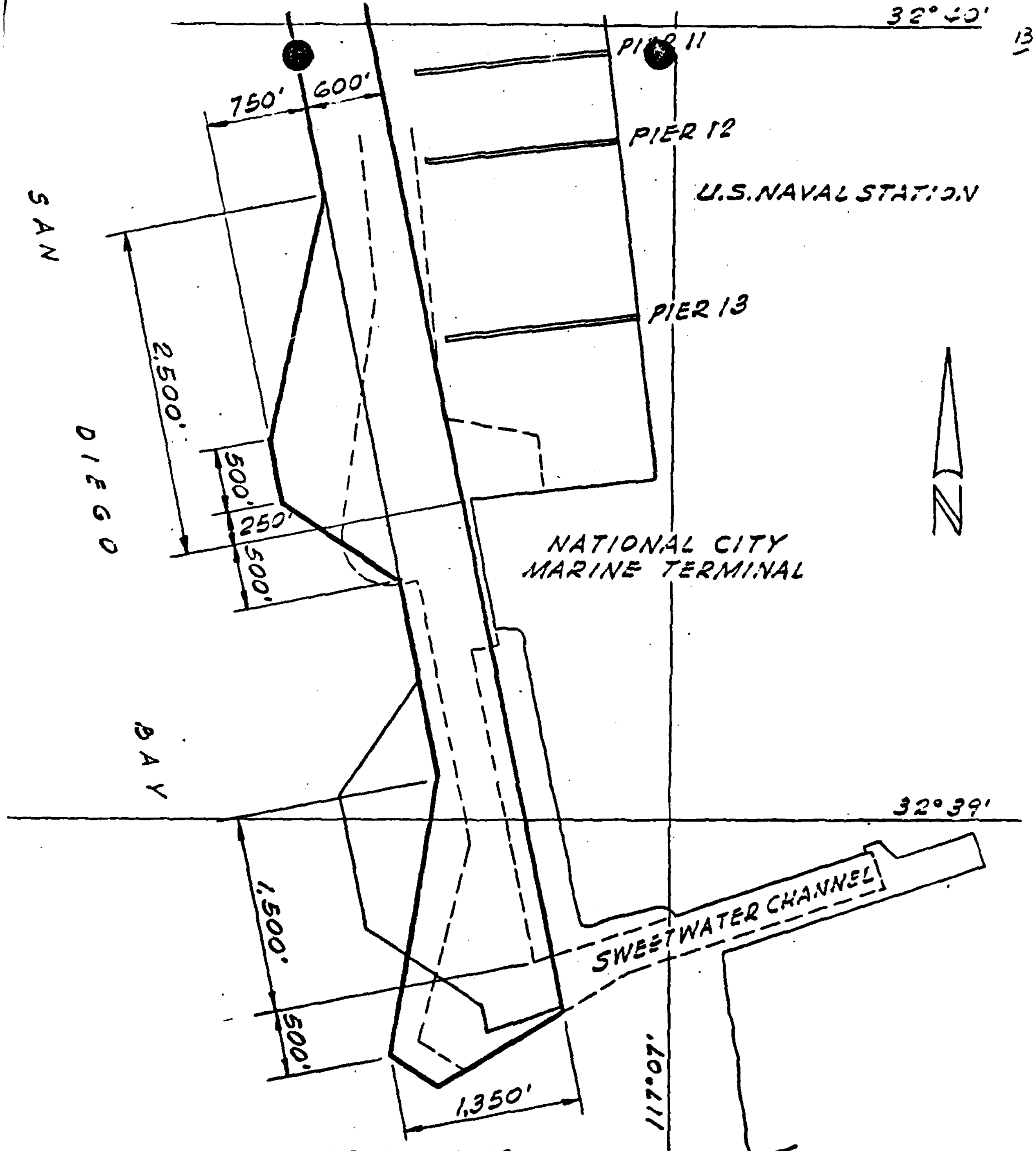
The attached sketch shows the desired configuration of two turning basins, the single turning basin as it appears on Plate 4 of the General Design Memorandum, as well as the existing 30-foot (and 35-foot) channel. Dredge quantities for both concepts appear to be about the same, so there should not be an increase in cost.

We feel that the desired configuration, with two basins rather than one, will measurably improve ship docking and turnaround. This position is strongly supported by the Port's Chief Pilot.

Yours very truly,

J. E. LIEBMANN
Chief Engineer

JEL/sf
Attachment




SCALE: 1:12,000

- REVISED TURNING BASINS
- TURNING BASINS AS IN G.D.M.
- EXISTING 30' (OR 35') CHANNEL

SAN DIEGO UNIFIED PORT DISTRICT
NATIONAL CITY MARINE TERMINAL
(2) REVISED TURNING BASINS
REF: GENERAL DESIGN MEMORANDUM NO. 1

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
COMMANDER (mep)
ELEVENTH COAST GUARD DISTRICT
HEARTWELL BLDG.
19 PINE AVE.
LONG BEACH, CALIF. 90802

5922/23
17 MAY 1974

Chief, Engineering Division
Los Angeles District
Army Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

This is in regard to the draft environmental impact statement concerning Corps of Engineer's improvement project in San Diego Harbor, San Diego, California.

The environmental impact statement has been reviewed and there are no objections to the project and no comments on the content of the statement.

Thank you for the opportunity to comment on your project.

Sincerely,

C. D. MORRISON
Lieutenant Commander, U. S. Coast Guard
Chief, Maritime Environmental Protection
and Port Safety Branch
By direction of the District Commander

SAN DIEGO GAS & ELECTRIC COMPANY
P. O. BOX 1831 SAN DIEGO, CALIFORNIA 92112
(714) 232-4252

May 22, 1974

FILE NO.
LND 210

Mr. Garth A. Faquay, Chief
Engineering Division
Department of the Army
Los Angeles District Corps
of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Mr. Faquay:

RE: SAN DIEGO BAY DREDGING

In response to your letter of 29 March 1974, the following modifications are suggested:

DRAFT ENVIRONMENTAL STATEMENT -

It is requested that Section 14b, page 5 be revised to read as follows:

"b. San Diego Gas & Electric Company Facilities

The San Diego Gas & Electric Company will remove and reinstall its facilities in phases. Facilities involved comprise six power lines (five 12 kv and one 69 kv) and four gas lines (two 4-inch, one 6-inch and one 10-inch). In general, the Company's plan for relocation calls for removal of the 69 kv line, three 12 kv lines, the two 4-inch gas lines and the 6-inch gas line from the western half of the project area and reinstallation of the 69 kv line directly on the floor after this area is dredged as part of the Federal project. The two 12 kv lines, the 6-inch gas line and the 10-inch gas line in the eastern half of the project area will then be removed and the 10-inch gas line reinstalled after that area is dredged as part of the Federal project. The Company will dredge a trench in the eastern half of the project area to accommodate the reinstalled gas line. The dredged material will be stockpiled on the Bay bottom adjacent to the trench and replaced in the trench after the line is installed. Prior to removal of the existing 69 kv power line, a new 69 kv line will be put in service. The new 69 kv line will be placed in an existing conduit which was installed 57 feet below the MLLW level of the channel in anticipation of the Federal project. Utility relocation work will require a crane barge guided by tugboats."

Also, the words "firm power service," Section 161b, page 44, should be replaced by "electric service," The word "firm" has a technical connotation which makes the current wording misleading.

DRAFT DESIGN MEMORANDUM -

Section 13-01 should be revised to indicate "four natural gas pipelines and six power lines." Although each of these power lines is made up of a number of "cables," it is customary to refer to them collectively as a circuit or line.

Appendix 2, page A2-1, the last sentence of paragraph 3, implies that all transbay utilities are to be buried. This is not the case. By prior agreement with the San Diego Unified Port District, San Diego Gas & Electric Company facilities which can be relocated in the event of future dredging are not required to be placed subsurface. Perhaps the best solution here is to delete this last sentence.

The list and disposition of San Diego Gas & Electric Company facilities in Table 2-1 should be revised as follows:

| | |
|---|---|
| 12 kv ckts 111, 115B, 117B | To be abandoned and removed |
| Two 4" gas lines | To be abandoned and removed |
| 10" gas line | To be relocated |
| 69 kv ckt | New installation |
| 69 kv ckt 655 | To be relocated |
| 12 kv ckts 115A, 117A | To be abandoned and removed |
| 6" gas line | To be abandoned and removed |

Attached as Exhibit (1) is a slightly revised copy of Table 2-2.

With regard to Plate 2-1, a realignment of relocated facilities is being coordinated with the Navy. The San Diego Port District is being kept apprised of these changes and, upon final resolution, will advise you of the resulting modifications as a package.

SAN DIEGO GAS & ELECTRIC COMPANY



I thank you for this opportunity to comment on the draft documents. If I can be of further assistance, please do not hesitate to contact me at (714) 232-4252, extension 1720.

Sincerely yours,

J. M. Burns
Associate Engineer

JMB:kam

Attachment

cc: Mr. D. R. Forrest
Special Projects Engineer

PORT OF SAN DIEGO
AND SAN DIEGO INTERNATIONAL AIRPORT (LINDBERGH FIELD)

3165 PACIFIC HIGHWAY • SAN DIEGO, CALIFORNIA
Telephone 291-3900 • Mailing Address: P. O. Box 488, San Diego 92112

May 24, 1974

Mr. Frank Buchholz
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box 2711
Los Angeles, California 90053

Dear Frank:

Re: Proposed Fifth Avenue Fill
Site, San Diego

In accordance with your request, we are forwarding herewith five prints, two of which have been colored, of our present concept for the future development of the proposed Fifth Avenue fill site. I must emphasize that this is tentative and a great deal of additional thought and planning will be devoted to this project before a final development plan is approved.

We have engaged a consulting firm to prepare an economic feasibility report for the redevelopment of the entire San Diego Centre City Waterfront. Furthermore, we are in the process of engaging a second consulting firm for Phase II of this project--a land use planning and urban design firm--who will prepare a precise redevelopment plan. The Fifth Avenue fill will be an important part of the overall project which will run through the whole gamut of approval processes, including development of an environmental impact report before construction begins.

The enclosed sketches will be an input to the consultant's study. You will understand, however, that changes will become desirable and necessary.

Yours very truly,

J. E. Liebmann

J. E. LIEBMANN
Chief Engineer

JEL/sf
Attachments

13/8.01 San Diego

PORT OF SAN DIEGO
AND SAN DIEGO INTERNATIONAL AIRPORT (LINDBERGH FIELD)
3165 PACIFIC HIGHWAY • SAN DIEGO, CALIFORNIA
Telephone 291-3900 • Mailing Address: P. O. Box 488, San Diego 92112

June 6, 1974

District Engineer
Los Angeles District
Corps of Engineers
P.O. Box 2711
Los Angeles, California 90053

Attention: Mr. Garth A. Fuquay, Chief, Engineering Division

Dear Sir:

Re: Navigation Improvement, San Diego Harbor; Comments on the Draft General Design Memorandum and Draft Environmental Statement

In response to your request of 29 March 1974 there are attached the Port District's comments on the draft General Design Memorandum and draft Environmental Statement for navigation improvement in San Diego Harbor.

The opportunity to review and comment on these documents is very much appreciated.

Yours very truly,

J. E. Liebmann

J. E LIEBMANN
Chief Engineer

JEL/sf
Attachments

DRAFT GENERAL DESIGN MEMORANDUM
FOR NAVIGATION IMPROVEMENT
SAN DIEGO HARBOR

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES

COMMENTS BY SAN DIEGO UNIFIED PORT DISTRICT
6 June 1974

Paragraph 6-01:

Consistent with our letter to you of 15 April 1974, we suggest the last part of the last sentence read "...with turning basins 35 feet deep between miles 11.67 and 12.24, and between miles 12.53 and 12.9+."

Paragraph 6-05 b:

We suggest the first sentence read "This segment of the channel is between miles 7.0 and 11.67.", and the last part of the last sentence read "...and dredging a 35-foot channel with varying widths (1,300 feet to 600 feet) from miles 9.1 to 11.67."

Paragraph 6-05 c:

This should read "This segment of the channel extends from mile 11.67 to 12.9+. The improvement consists of dredging a 35-foot deep channel and two combined turning basins varying in width from 600 feet to 1,350 feet between miles 11.67 and 12.24, and between miles 12.53 and 12.9+."

Paragraph 8-07:

It is suggested that the table accompanying this paragraph be reviewed. It appears that some channel depths may be excessive, notably, 48 feet for carriers and the cruiser-destroyer fleet, 35 feet for the Coast Guard fleet, and 25 feet for recreational boats.

Paragraph 9-03:

Because a container terminal has been developed at the National City Marine Terminal rather than a general cargo facility requiring transit sheds, we recommend that the third sentence beginning

"This commitment to the Federal Government..." be deleted. The last sentence should read "A recently completed berth on the west face has been developed as a container terminal, with a 500-foot wharf and container crane, paved container storage area, and a 100,000 square foot warehouse."

Paragraph 9-11 a:

A project depth of 35 feet from mile 8.84 to mile 12.9+ was selected during preparation of the Interim Review of Reports in 1967, on the basis of draft requirements of the C-4 Mariner general cargo vessel. Since that time a portion of the National City Marine Terminal has been developed as a container terminal. A channel depth of 35 feet is now marginal for larger container vessels. There may be occasions when fully loaded container ships will be delayed for favorable tides. It is recognized that it is impracticable now to revise the project depth for this channel segment. However, as mentioned in paragraph 11-04, it is important that the depth requirements be reevaluated prior to 1985.

Paragraph 9-22 b(3):

We believe this statement concerning the advantages of not filling the "D" Street site is subjective, and we disagree with it. The site was relinquished because of objections by environmentalists.

Paragraph 10-27:

The second sentence of this paragraph, pertaining to proposed use of the Fifth Avenue fill, is misleading. Although a precise plan has not been developed, the principal use of the area will be recreational. The area is included in a land-use planning study encompassing the entire Embarcadero which will begin soon. The plan resulting from this study will require approval of all regulatory agencies.

Page XV-7:

In this estimate under Non-Federal Costs, Retaining Dike, 5th Avenue, there should be added the item:

| | | |
|---|---|---|
| Storm Drain Extension | -- | $18,000 |
| and the subtotal increased to | -- | $593,000 |

Paragraph 16-02 a(2):

Utilities relocation will be accomplished in three steps rather than four. Provision of temporary facilities, indicated as step (a), will not be necessary.

Paragraph 20-03:

In the first sentence tonnages should be 1,091,000 in 1971 and 3,409,000 tons in the year 2030.

Paragraph 21-05:

In the first sentence the phrase "...local interests have indicated that they desire no change in their cash contributions..." would be more accurately stated "...local interests have indicated that they agree to no change in their cash contributions...".

Plate 6:

The Dredge Schedule should be revised as follows:

Area 7 should read "Mile 8.60 to 10.20".

The schedule for dredging Areas 8 and 9 should be "D" (It is important to the Port District that dredging of the southerly portion of the channel be accomplished as early as practicable).

An item should be added for dredging structural sand in Area 8.

Table 2-2:

This table will be updated by the Port District, and forwarded under separate cover.

Plate 2-1:

This drawing will be updated by the Port District, and forwarded under separate cover.

Table 4-6:

Under Future Terminals, Terminal Area, Columns 4 and 5, these areas should be 79 acres rather than 26 acres.

AD-A136 672 NAVIGATION IMPROVEMENT DESIGN MEMORANDUM NUMBER 1 GENERAL DESIGN FOR SAN..(U) ARMY ENGINEER DISTRICT LOS ANGELES CA FEB 75 1/1

UNCLASSIFIED F/G 13/2 NL

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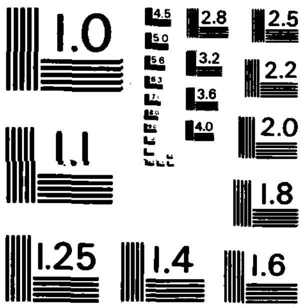


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DRAFT ENVIRONMENTAL STATEMENT
SAN DIEGO HARBOR

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES

COMMENTS BY SAN DIEGO UNIFIED PORT DISTRICT
6 June 1974

Paragraph 3b preceeding the Table of Contents:

Contrary to this statement, the General Design Memorandum, paragraph 10-13, states the the Fifth Avenue site benthic habitat is not of high value.

Paragraph 8:

The last part of the last sentence should be changed from "...are presently very limited." to read "...have just been completed."

Paragraph 10.b:

The sixth sentence, beginning "Associated development on the landfill..." should be deleted because a precise plan has not yet been developed. It is expected, however, that the principal use will be recreational. Similarly, the words "its perimeter" should be deleted from the seventh sentence. The area is included in a land-use planning study encompassing the entire Embarcadero which will begin soon. The plan resulting from this study will require approval of all regulatory agencies.

Paragraph 17:

The area of San Diego Bay at half tide, as determined by the Port District, is 16.58 square miles rather than 18.

Paragraph 31:

The second sentence regarding Dr. Inman's studies pertaining to submarine canyons may have resulted from a misunderstanding. While the statement is generally true throughout the Southern

California Coast, it does not appear to apply to the Silver Strand. Sand moving northward along the Strand probably deposits on Zuniga Shoal and adjacent deeper waters.

Paragraph 36:

The area of San Diego Bay at half tide, as determined by the Port District, is 16.58 square miles rather than 21.

Paragraph 80:

It is our understanding that debris from shipyard sand blasting is no longer introduced into the bay but is transported to an approved sanitary landfill site.

Paragraph 172.a:

A project depth of 35 feet from mile 8.84 to mile 12.9+ was selected during preparation of the Interim Review of Reports in 1967, on the basis of draft requirements of the C-4 Mariner general cargo vessel. Since that time a portion of the National City Marine Terminal has been developed as a container terminal. A channel depth of 35 feet is now marginal for larger container vessels. There may be occasions when fully loaded container ships will be delayed for favorable tides. It is recognized that it is impracticable now to revise the project depth for this channel segment. However, as mentioned in paragraph 11-04 of the General Design Memorandum, it is important that the depth requirements be reevaluated prior to 1985.

Paragraph 188:

An important step has been taken toward reduction of bay pollution by the enactment of an ordinance requiring holding tanks for live-aboard vessels, and the provision of pump-out facilities.

Paragraph 189:

This statement is true with or without the dredging project.

Appendix B, Paragraph 61:

An electric-powered dredge of the type likely to be used on this project is very quiet, and, unless gravel is being dredged, discharge is not noisy.

RETYPED FOR REPRODUCTION

SPLED-CN 7 June 1974

Mr. R. K. Martinson
Regional Director
Bureau of Sport Fisheries and Wildlife
P.O. Box 3737
Portland, Oregon 97208

Dear Mr. Martinson:

Reference is made to your letter of 26 March 1974 concerning San Diego Harbor navigation project.

We recently received several prints of the San Diego Unified Port District's present concept for the future development of the proposed Fifth Avenue fill site. One of these prints and a copy of the transmittal letter are forwarded in response to your request for more detailed information of this development.

Sincerely yours,

GARTH A. FUQUAY
Chief, Engineering Division

2 Incl
As stated

COMMANDANT
ELEVENTH NAVAL DISTRICT
SAN DIEGO, CALIFORNIA 92132

IN REPLY REFER TO
11000
Ser 32/119
14 JUN 1974

From: Commandant, Eleventh Naval District
To: District Engineer, Department of the Army, Los Angeles, Corps of Engineers, P. O. Box 2711, Los Angeles, California 90053

Subj: Draft General Design Memorandum and Draft Environmental Statement for San Diego Harbor Improvement Project

Ref: (a) COMELEVEN ltr 11000 Ser 32/113 of 20 May 74
(b) U.S. Army Corps of Engineers SPLED-CN of 24 May 74

Encl: (1) Copy of news item from the San Diego Union of 12 June 74

1. Reference (a) forwarded the Navy comments on the draft General Design Memorandum and the draft Environmental Statement for the authorized improvement project in San Diego Harbor, San Diego County, California. Subsequent to the transmission of reference (a), reference (b) was received which advised that certain changes to the subject documents had been made:

a. The disposal site for 160,000 cubic yards of dredge spoil on the bayward side of the Silver Strand in the area contiguous to the south boundary of the Naval Amphibious Base has been deleted from the recommended plan for improvement.

b. The disposal site for 340,000 cubic yards of dredge spoil on the bayward side of the Silver Strand on the mudflat which was created by deposition of dredge spoil from the Coronado Cay project, also has been deleted from the recommended plan of improvement.

c. Dredge spoil which was to be placed in the above areas will now be placed on the Silver Strand ocean beach.

2. In reply to reference (b) the following comments pertain:

a. The Navy has yielded to civilian use of the Delta Beach area for water oriented recreation, open to the general public when training is not in progress. The background and details are contained in enclosure (1).

b. The disposal site for approximately 340,000 cubic yards scheduled for deletion per paragraph 2b of reference (b) should be maintained. It is felt, in light of the recent decision to allow

11000
Ser 32/119
24 JUN 1974

public use of the beaches and water contiguous to the Naval Amphibious Base for water skiing, that off the highway parking will have to be provided. Further, by filling the mud flat area, additional beach area could be made available for joint use which in turn would move the recreational activity away from Beach Lane Delta.

c. Concur with the deletion of the disposal site for 160,000 cubic yards on the south side of the Naval Amphibious Base listed in paragraph 2a of reference (b).

d. No objection is made to placement of the 160,000 cubic yards of dredge spoil on the Silver Strand ocean beach.

3. The Navy will defer to other interested agencies comments with regard to the impact on the natural environment.

F. B. Gilkeson

F. B. GILKESON

Copy To:
COMPHIBPAC
CO NAVPHIBASE
CO WESTNAVFACENGCOM

TRAINING COMES FIRST

SAN DIEGO UNION
12 Jun 1974

# Skiers Can Use Navy Beach

Water skiers may continue to use a portion of the Navy's amphibious training site on the Silver Strand as long as they do not interfere with training, according to Rear Adm. Fillmore Gilkeson, commandant of the 11th Naval District.

Gilkeson said Delta Beach, that section of the bay side of the Silver Strand immediately south of the Naval Amphibious Base, is a joint civilian and military recreation area open to the general public when training is not in progress.

He said the recreation area extends about two miles south of the base.

There had been numerous recent complaints from water skiers who have used the beach for years. They said they were being barred from the area by Navy security personnel and Coronado policemen.

The action came after an $81,532 judgment against the government involving a boater injured at the military site.

The executive officer of the amphibious base said last week the Navy was reconsidering its position on public use of the beach in light of the court judgment.

Gilkeson said, "Safety is of paramount importance. From time to time water skiers have interfered with Navy training exercises in this area."

In addition to the Navy landing craft using the beach, Navy swimmers also use the waters off the beach for various activities.

"It must be emphasized that Delta Beach is part of the only beach area of its type on the West Coast suitable for primary landing-boat training," Gilkeson said, "and is considered essential for training-boat companies prior to training in heavy surf."

Gilkeson said the Navy has proposed using materials from the dredging of the harbor to create a new recreational beach on Navy land to separate the joint use of the training beach.

ENCLOSURE (1)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Garth A. Fuquay, Chief
Engineering Division
Corps of Engineers
P.O. Bo· 2711
Los Angeles CA 90053

JUL 8 1974

Dear Mr. Fuquay:

The Environmental Protection Agency has received and reviewed the draft environmental impact statement for the following proposed project, San Diego Harbor, San Diego County, California. The additional information transmitted in your May 24, 1974 letter was considered in the review. Moreover, the review was performed in conjunction with the "General Design Memorandum, San Diego Harbor, San Diego County, California".

EPA's comments on the draft statement have been classified as Category ER-2. Definitions of the categories are provided on the enclosure and our extensive comments will be found on a second enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the impact statement at the draft stage.

EPA appreciates the opportunity to comment on this draft statement and requests two copies of the final statement when available.

Sincerely,

Paul DeFalco, Jr.
Regional Administrator

Enclosures

cc: Council on Environmental Quality, Wash., DC 20460
Attn: Editor, 102 Monitor

Environmental Impact of the Action

LO--Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER--Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU--Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1--Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2--Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3--Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

Comments on the draft environmental impact statement, San Diego Harbor, San Diego County, California.

1. For ocean disposal at the 100 fathom site, bottom sediment analysis for mercury, cadmium, lead, zinc, and oil and grease are required.

   For aquatic disposal at the Point Loma (45 fathom) site, bottom sediment analysis for mercury, cadmium, lead, zinc, and oil and grease are required. In view of the past history of this project, the recently promulgated elutriate requirement will be waived.

   For landfill behind impermeable dikes, no analyses are required.

   For beach restoration, particle size analyses are required.

2. Any portion of the area to be dredged is eligible for 100 fathom ocean disposal (32°36'50"N, 117°20'40"W - 7.7 nautical miles from shore).

3. Aquatic disposal at the San Diego - Point Loma Site (32°35'00"N, 117°17'30"W - 54 nautical miles offshore) is allowed only if the results of the bottom sediment analyses are less than:

   1.0 ppm mercury
   2.0 ppm cadmium
   50.0 ppm lead
   130.0 ppm zinc
   1500.0 ppm oil and grease (as per EPA Region IX Dredge Spoil Disposal Criteria)

   All of the material proposed for disposal at this site is not eligible for disposal there. A letter stating which materials are suitable for disposal at the Point Loma Site will follow.

4. Beach restoration with dredge spoils is only allowed if the material is substantially sand (approximately 91% by weight not passing through a #200 sieve). Some of the material proposed for beach restoration does not meet this requirement. A letter stating which materials are suitable for beach restoration will follow.

5. Side-casting of dredge spoils for the purpose of utility relocations is allowed only if the material is shown to be unpolluted according to the Region IX Dredge Spoil Disposal Criteria.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
~~BUREAU OF SPORT FISHERIES AND WILDLIFE~~

1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

Reference: RB

Your reference:
SPLED-CN
March 29, 1974

July 9, 1974

District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Sir:

In accordance with your request, we have reviewed the draft General Design Memorandum for San Diego Harbor, San Diego County, California. This document, dated March 1974, was amended on May 24, 1974, to delete two proposed fills south of the Naval Amphibious Base.

In our previous discussions regarding this project we voiced our concern about the landfill to be placed at Fifth Street. The filling of navigable waters with the attendant loss of bay habitat and associated marine organisms for the express purpose of creating sites for constructing restaurants, motels, hotels, parking lots, or other nonwater-dependent facilities cannot be countenanced if we are to preserve the living resources of this area for the continuing benefit and enjoyment of all our citizenry. The San Diego Unified Port District has indicated that this fill will be incorporated into a plan for redevelopment of the entire San Diego Center City Waterfront. However, a detailed land use plan for this fill has yet to be prepared.

We do not object to the creation of a harbor for recreational boats but question the need to place over one-and-a-quarter-million cubic yards of spoil to achieve this end. The Fifth Street fill should be only large enough to accommodate the facilities necessary for the successful operation and enjoyment of a public marina and any essential commercial enterprises that are unquestionably water-oriented and water-dependent.

We request that before any fill is placed at the Fifth Street site, the Unified Port District submit a detailed plan describing how the site will be developed. In addition, we would like a commitment that the proposed fill will only be used to support water-oriented, water-dependent activities.

In the past we have also objected to the fills proposed for the Navy property bayward of the Silver Strand. We were encouraged to learn that two of these damaging fills have been deleted from the project. However, the General Design Memorandum fails to adequately describe the remaining fill to be placed at this site. The reviewer is left to guess what shape and size the fill will take and the purpose for its emplacement. The draft EIS suggests that this fill is required to protect utility poles and lines against erosion. We submit that the deposition of one-half-million cubic yards of an easily erodible sandy material is not an environmentally acceptable method to achieve the desired protection. We believe the required protection can best be realized by placing rock riprap along the present beach or, if necessary, riprapping a modest fill bayward of the present shoreline. If this suggestion is followed, a sizeable productive intertidal area would be preserved and important adjoining wetlands would be protected against subsequent degradation by the slow movement of spoil away from the fill site.

We realize that the Corps may then have problems finding alternative dredge disposal sites if some of the material earmarked for Fifth Street and the Navy Amphibious Base are placed elsewhere. We would like to suggest two alternative disposal areas that you may have possibly overlooked. One rather obvious site is the beach area in Border Field State Park. Another area that bears investigation is the sand and gravel excavation pits in the Tijuana River bed in the vicinity of Dairy Mart Road. These excavations are now being used indiscriminantly and illegally as refuse dumps. Filling these areas would remove any opportunity to carry on this practice. There is a possibility that some of the sand deposited in the Tijuana River could be carried out to sea during periods of flooding and eventually provide nourishment for coastal beaches. The feasibility of this proposal, however, is dependent on its cost and the possibility of the salinity of the deposits affecting the ground water supply.

We appreciate the opportunity to comment on the General Design Memorandum and ask the Corps to give the above views careful consideration. We would be pleased to discuss these issues with members of your staff or answer any questions to the best or our ability. In this regard, please contact Mr. M. S. Zschomler, Field Supervisor, River Basin Studies, at FTS (213) 836-2408.

Sincerely yours,

R. Kahler Martinson

R. Kahler Martinson
Regional Director

AAN B. LIVERMORE, JR.
SECRETARY

RONALD REAGAN
GOVERNOR OF
CALIFORNIA

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

Dept. of Conservation
Dept. of Fish and Game
Dept. of Navigation and
Ocean Development
Dept. of Parks and Recreation
Dept. of Water Resources

Air Resources Board
Colorado River Board
San Francisco Bay Conservation and
Development Commission
Solid Waste Management Board
State Lands Commission
State Reclamation Board
State Water Resources Control Board
Regional Water Quality Control Boards

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

JUL 9 1974

Colonel John V. Foley
District Engineer
Los Angeles District
U. S. Army Corps of Engineers
Post Office Box 2711
Los Angeles, CA 90053

Dear Colonel Foley:

The State of California has reviewed the Navigation Improvement Design Memorandum No. 1, General Design for San Diego Harbor, San Diego County, and the *Draft Environmental Statement, San Diego Harbor, San Diego County*, which was submitted to the Office of Intergovernmental Management (State Clearinghouse) within the Governor's Office. The review accomplished by the State fulfills the requirements under Part II of the U. S. Office of Management and Budget Circular A-95 and the National Environmental Policy Act of 1969.

These materials were reviewed by the State Departments of Food and Agriculture, Transportation, Health, Conservation, Fish and Game, Navigation and Ocean Development, Parks and Recreation, and Water Resources; the California Coastal Zone Conservation Commission; the State Water Resources Control Board; the Air Resources Board; and the Solid Waste Management Board. The State's specific comments are attached and the general comments are as follows:

The State is concerned with the concept of perpetuating the "History of filling of the bay for a variety of purposes", as is expressed on page 55 of the Draft Environmental Statement. The State is particularly concerned because its Silver Strand Beach relies upon the quality of the bay and its waters for its ability to continue to provide high quality bay recreation services to the public.

The State feels that, because the Statement does not seriously weigh the elimination of disposal sites within San Diego Bay, it fails to meet all the requirements of the National Environmental

Policy Act. Therefore, the State is opposing the San Diego Harbor Project until the spoils now planned for the Naval Amphibious Base, are placed on an ocean beach disposal area in the vicinity of Imperial Beach. The total spoil to be placed at Imperial Beach would be 3,000,000 cubic yards as opposed to the planned 2,000,000.

Thank you for the opportunity to review these materials.

Sincerely yours,

N. B. LIVERMORE, JR.
Secretary for Resources

By Paul L Clifton

Attachment

cc: Director of Management Systems
State Clearinghouse
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH No. 74040852)

## SPECIFIC COMMENTS ON THE DRAFT ENVIRONMENTAL STATEMENT, SAN DIEGO HARBOR, AND ON *THE NAVIGATION IMPROVEMENT DESIGN MEMORANDUM NO. 1*, GENERAL DESIGN FOR SAN DIEGO HARBOR, SAN DIEGO COUNTY, CALIFORNIA

These specific comments are an integral part of the State's general comments:

Design Memorandum No. 1

The Federal Principles and Standards for Planning Water and Related Land Resources became effective on October 25, 1973. They place environmental concerns on an equal basis with economic development by requiring that at least two alternative plans be formulated, one a plan that best contributes to the realization of the national economic development objective, and one that best serves the environmental objective. The Principles and Standards further provide that the beneficial and adverse effects of each project alternative be displayed in a system of accounts so that alternatives to the proposed project may be readily compared. Further, the Principles and Standards may be applied to previously authorized but unfunded projects at the discretion of the head of the agency. Because the Principles and Standards were not fully applied in preparing this report, the authority for departing from these criteria should be cited.

Page XX-1, paragraph 5(a): Recreation benefits were not included as one of the benefits attributable to the project even though they could be substantial. Excluding these benefits could have a significant effect on the allocation of costs between local interests and the Federal Government. In addition, the costs of certain "self-liquidating" items, such as ships, structures, utilities, and roads, which were estimated to amount to $30 million, were excluded from the analysis. It would seem that the portion of the self-liquidating costs needed to realize project benefits and any recreation benefits attributable to the project should be included in the benefit-cost analysis, in the absence of compelling reasons for their exclusion.

Draft Environmental Statement

Page 3, paragraph 10: The Corps now plans to use two spoil disposal areas within San Diego Bay, the Fifth Avenue and Naval Amphibious Base areas. Both eliminate habitat critical to a host of fish and wildlife species, including two endangered species (least tern and brown pelican). The types of habitat present differ. The Fifth Avenue site is primarily shallow water habitat used by diving ducks, various fishes, and many types of fish-eating birds. A total of 22 acres will be filled at the Fifth Avenue site to create a small boat basin. Therefore, this fill does have some public water-related benefits to offset the fish and wildlife values destroyed.

There are no offsetting public benefits, however, to the Naval Amphibious Base fill. This 33-acre fill will eliminate tidal mudflat as well as shallow water habitat. The mudflat habitat is in critically short supply in California and especially in Southern California. The discussion of the alternatives considered for this fill indicates that these alternatives were not really evaluated. Pages 50-53 of the draft ES -- state that ocean beach disposal is feasible in the instances where in-bay disposal is recommended. Ocean beach disposal would cost only $278,000 more than would filling the bay. The advantages are beach nourishment and avoidance of in-bay fill effects, such as a permanent loss of critical fish and wildlife

habitat and the decrease in tidal flushing within the bay. The advantages of the Naval Amphibious Base fill which the Corps claims outweigh the advantages of ocean beach disposal are:

1. Existing shoreline erosion would be mitigated,
2. Naval personnel would have their private sandy beach,
3. A replacement facility for the U. S. Navy Construction Battalion would be available, and
4. A public day use area could be created to replace the existing area used by the public if existing public trespass is curtailed.

The State's analysis of these so-called advantages of the Naval Base fill is that they do not outweigh the advantages of ocean beach disposal because:

1. Shoreline erosion will not be controlled with dredging spoil because it is composed of essentially the same sand which eroded away. Rock protection may be necessary in either instance.

2. Naval personnel are within walking distance of Silver Strand public beach and do not need a private beach.

3. A replacement facility may possibly be placed elsewhere on the Base or at another Navy installation. Hunter's Point Naval Shipyard, for example, may be capable of accommodating this facility.

4. The Navy should maintain existing public use.

INCL 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

AUG 21 1974

Garth A. Fuquay
Chief, Engineering Division
Department of the Army
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles CA 90053

Dear Sir:

This is in response to your request for comments on "Design Memorandum No. 1, General Design for San Diego Harbor."

The Design Memorandum states that "approximately 1,000,000 cubic yards of non-structural material will be dredged from the channel between miles 10.2 and 11.6 and disposed in the open ocean at the Point Loma site (32° 35' 00"N, 117° 17' 30" W). EPA Region IX Interim Dredge Spoil Disposal Criteria (DSDC) allows disposal at the Point Loma site only if the concentrations of pollutants in the sediment are less than the following: 1.0 ppm mercury, 2.0 ppm cadmium, 50 ppm lead, 130 ppm zinc, and 1,500 ppm oil and grease. The bottom sediment analyses indicate that none of the material in the channel between miles 10.2 and 11.6 meets the DSDC criteria for disposal at the Point Loma site. This material must be disposed on land or in the ocean at the designated 100 fathom site (32° 36' 30"N, 117° 20' 40"W). A list of the core sediments which do not meet DSDC criteria for disposal at the Point Loma site follows as an attachment (Enclosure 1).

The Draft Environmental Statement indicates that about 5,055,000 cubic yards of the material derived from channel dredging in the reaches from mile 8.6 to 10.2, and 11.6 to 12.9 will be used for beach restoration. Beach restoration with dredge material is consistent with EPA criteria only if the material is substantially naturally occurring sand (approximately 91% by weight does not pass through a # 200 U.S. sieve). A list of all cores which do not meet the criteria for beach disposal follows as an attachment (Enclosure 2).

In summary,

1) we do not object to the disposal of 174,000 cubic yards of material from the bends in the north bay at the Point Loma site (32° 35' 00"N, 117° 17' 30"W);

2) we do not object to the Fifth Avenue fill, nor to the fill south of the Naval Amphibious Base, as long as the waste discharge requirements set by the San Diego Regional Water Quality Control Board are met;

3) the approximately 1,000,000 cubic yards of material from mile 10.2 to 11.6 does not meet the DSDC guidelines for disposal at the Point Loma site. This material should be disposed on land or in the ocean at 100 fathoms (32°36'50"N, 117° 20' 40"W); and

4) we do not approve of the use of a portion of the material proposed for beach restoration. The cores not eligible for beach disposal are listed in Enclosure 2.

Sincerely,

R. L. O'Connell
Director, Enforcement Division

2 Attachments

ENCLOSURE 1

The sediments between miles 10.2 and 11.6 represented by the following cores are not eligible for disposal at the Point Loma site (32° 35' 00"N,117° 17' 30"W):

| Sample # | Elevation below MLLW (ft) | Pollutants over DSDC Limits |
|---|---|---|
| E11A | surface (-38.9) | Hg(1.2), Pb(60 ) Zn(209), O&G(3,000) |
| E11AD | surface (-38.9) | Hg(1.5), Pb(89.6), Zn(289), O&G(4,900) |
| E11B | surface (-33.4) | Hg(1.8), Pb(66.0), Zn(169), O&G(2,700) |
| E11G | 0 to 4.7 below surface | Hg(2.6), Pb(138), Zn(160), O&G(4,800). Cd(3.0) |
| E12A | surface (-30.5) | Pb(51.3), Zn(187), O&G(2,000) |
| E12AD | surface (-30.5) | Hg(1.3), Pb(82.8), Zn(300), O&G(4,600) |
| E12B | surface (-33.7) | Zn(150), O&G(2,300) |
| E12BD | surface (-33.7) | Hg(1.1), Pb(53.7), Zn(140), O&G(1,900) |
| E12C | -33.6 | Zn(204), O&G(2,590) |
| E12G | 0 to 2.0 below surface | Hg(2.2), Pb(59), Cd(2.3), O&G(3,200) |
| E12H | 0 to 4.5 below surface | Hg(1.2), O&G(2,700) |
| E13A | -28.2 to 31.0 | Hg(1.5), Pb(94.5), Zn(373), O&G(4,400) |
| E13B | surface (-28.2) | Pb(65.4), Zn(210), O&G(2,000) |

ATTH 1

ENCLOSURE 2

The sediments represented by the following cores are not eligible for beach restoration:

| | CORE # | % retained by #200 sieve |
|---|---|---|
| Mile 8.6 to 10.2 | E8-C | 85% |
| | E9-C | 65% |
| | E10-C | 56% |
| | 70-17 | 85% |
| Mile 11.6 to 12.5 | E15-C | 9% |
| | 70-25 | 5% |
| | 70-26 | 86% |
| Mile 12.5 to 12.9 | E16-C | 1% |
| | 70-26 | 86% |
| | 70-28 | 82% |

ATTH 2

STATE OF CALIFORNIA—RESOURCES AGENCY RONALD REAGAN, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION
6154 MISSION GORGE ROAD, SUITE 205
SAN DIEGO, CALIFORNIA 92120

December 17, 1974

Department of the Army
Corps of Engineers
Los Angeles District
P. O. Box 2711
Los Angeles, California 90053

Attention: Mr. Garth A. Fuquay
Chief, Engineering Division

Gentlemen:

Re: U. S. Army Corps of Engineers
San Diego Harbor Improvement Project

Enclosed are two copies of Order No. 74-99, which was adopted by the California Regional Water Quality Control Board, San Diego Region, on December 9, 1974 to establish requirements for the discharge of dredge spoil and dredge spoil return water from the San Diego Harbor Improvement Project of the U. S. Army Corps of Engineers. Compliance with the requirements of Order No. 74-99 will involve considerable effort on your part. Our staff will be making frequent inspections to insure that compliance is achieved. They will be pleased to work with you and assist you in any way possible at all times.

Please note the enclosed monitoring program required by Order No. 74-99. Monitoring reports shall be furnished, under penalty of perjury, containing the required information at the frequency designated in the monitoring program. Failure to submit required monitoring reports constitutes a violation of the Order and is a misdemeanor under Division 7, Chapter 4, Article 4, Section 13268 of the California Water Code.

If additional copies of the Order are needed, we shall be happy to provide them. Please call Mr. Arthur Coe at (714) 286-5114 if you have any questions.

Very truly yours,

Leonard Burtman

LEONARD BURTMAN
Executive Officer

Encls.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

ORDER NO. 74-99

WASTE DISCHARGE REQUIREMENTS
FOR THE DISCHARGE OF DREDGE SPOIL AND
DREDGE SPOIL RETURN WATER FROM THE
SAN DIEGO HARBOR IMPROVEMENT PROJECT OF THE
U. S. ARMY CORPS OF ENGINEERS

The California Regional Water Quality Control Board, San Diego Region, finds that:

1. The U. S. Army Corps of Engineers submitted a Report of Waste Discharge dated January 19, 1971, proposing the discharge of up to 10 million cubic yards of dredge spoil and attendant dredge spoil return water from the San Diego Harbor Improvement Project. Subsequent to submission of the Report of Waste Discharge, the dredge spoil disposal plan was modified several times. The Corps of Engineers studied several alternative disposal plans and conducted a series of public hearings regarding the plans. By letter dated August 27, 1974, the Corps of Engineers informed the Board that a single dredge spoil disposal plan had been selected and requested the issuance of waste discharge requirements as soon as possible.

2. The San Diego Harbor Improvement Project consists of the deepening and widening of navigation channels and turning basins in San Diego Bay between a point in the vicinity of Ballast Point, near the entrance to the Bay, and a point near the mouth of the Sweetwater River.

3. Some of the dredge spoil would be disposed of at sites in San Diego Bay. The remainder would be discharged to Pacific Ocean waters. Approximate volumes of dredge spoil to be disposed of and associated disposal area locations are as follows:

| Disposal Site | Approximate Volume (Cubic Yards) |
|---|---|
| Within San Diego Bay: | |
| Foot of Fifth Avenue | 1,306,000 |
| Silver Strand near the Seaplane Basin | 500,000 |
| Pacific Ocean: | |
| Disposal Area at Latitude 32°35'00" North Longitude 117°17'30" West | 1,174,000 |
| Silver Strand Beach | 3,555,000 |
| Imperial Beach | 2,000,000 |

4. MATERIAL REMOVED FROM THE VICINITY OF THE ENTRANCE TO THE BAY AND MATERIAL DREDGED FROM THE INTERIOR OF THE BAY DEEMED UNSUITABLE FOR LANDFILL OR BEACH DISPOSAL WOULD BE BARGED TO THE DISPOSAL AREA IN THE PACIFIC OCEAN. THE REMAINDER OF THE MATERIAL WOULD BE REMOVED WITH A HYDRAULIC DREDGE AND PLACED IN THE DISPOSAL AREAS WITHIN SAN DIEGO BAY OR ON OCEAN BEACHES. THE SPOIL WOULD BE PLACED TO CREATE A 22-ACRE LANDFILL WHICH WOULD BE USED TO DEVELOP A SMALL MARINA AND BOAT BASIN AT THE SITE AT THE FOOT OF FIFTH AVENUE. MATERIAL PLACED ON BOTH THE BAY SIDE OF THE SILVER STRAND AND ON THE SILVER STRAND OCEAN BEACHES WOULD BE USED TO RESTORE ERODED SHORELINE.

5. THE ENVIRONMENTAL PROTECTION AGENCY, REGION IX, IS DEVELOPING DREDGE SPOIL DISPOSAL CRITERIA FOR THE TERRITORIAL SEA, CONTIGUOUS ZONE AND OCEAN WATERS. THE DREDGE SPOIL DISPOSAL CRITERIA CONTAINS GUIDELINES FOR DISPOSAL OF DREDGE SPOIL AT THE PACIFIC OCEAN DISPOSAL AREA AT LATITUDE 32°35'00" NORTH, LONGITUDE 117°17'30" WEST.

6. THE WATER QUALITY CONTROL PLAN (INTERIM), SAN DIEGO BASIN 9 WAS ADOPTED BY THIS REGIONAL BOARD ON JUNE 14, 1971 AND REVISED DECEMBER 11, 1972 AND JANUARY 22, 1973. THE INTERIM PLAN CONTAINS WATER OBJECTIVES FOR SAN DIEGO BAY.

7. THE INTERIM PLAN ESTABLISHED THE FOLLOWING BENEFICIAL USES FOR THE WATERS OF SAN DIEGO BAY:

   (A) INDUSTRIAL SUPPLY
   (B) WATER CONTACT RECREATION
   (C) AESTHETIC ENJOYMENT
   (D) COMMERCIAL FISHING AND SHELLFISH HARVESTING
   (E) NAVIGATION
   (F) SCIENTIFIC STUDY, RESEARCH AND TRAINING
   (G) MARINE HABITAT
   (H) MILITARY EXERCISES
   (I) CLAMMING AND SHELLFISH HARVESTING

8. THE STATE WATER RESOURCES CONTROL BOARD ADOPTED THE WATER QUALITY CONTROL POLICY FOR THE ENCLOSED BAYS AND ESTUARIES OF CALIFORNIA ON MAY 16, 1974. THE BAYS AND ESTUARIES POLICY CONTAINS THE FOLLOWING APPLICABLE REQUIREMENT:

   "4. DREDGE SPOILS TO BE DISPOSED OF IN BAY AND ESTUARINE WATERS MUST COMPLY WITH FEDERAL CRITERIA FOR DETERMINING THE ACCEPTABILITY OF DREDGED SPOILS TO MARINE WATERS, AND MUST BE CERTIFIED BY THE STATE BOARD OR REGIONAL BOARDS AS IN COMPLIANCE WITH STATE PLANS AND POLICIES."

9. THE BOARD HAS NOTIFIED THE DISCHARGER AND ALL KNOWN INTERESTED PARTIES OF ITS INTENT TO PRESCRIBE WASTE DISCHARGE REQUIREMENTS FOR THE PROPOSED DISCHARGE.

10. THE BOARD IN A PUBLIC MEETING HEARD AND CONSIDERED ALL COMMENTS PERTAINING TO THE PROPOSED DISCHARGE.

11. A COMPREHENSIVE ENVIRONMENT ASSESSMENT HAS BEEN PREPARED FOR THIS PROJECT BY THE CORPS OF ENGINEERS AND NO LONG TERM ADVERSE EFFECTS ON THE WATERS AND BOTTOM OF SAN DIEGO BAY ARE ANTICIPATED.

IT IS HEREBY ORDERED, THAT THE U. S. ARMY CORPS OF ENGINEERS SHALL COMPLY WITH THE FOLLOWING WASTE DISCHARGE REQUIREMENTS FOR THE DISPOSAL OF DREDGE SPOIL AND DREDGE SPOIL RETURN WATER IN SAN DIEGO BAY:

A. DISCHARGE SPECIFICATIONS

1. THE DISCHARGE OF DREDGE SPOIL AND DREDGE SPOIL RETURN WATER SHALL BE SO MANAGED THAT THE BENEFICIAL USES OF SAN DIEGO BAY AS RECOGNIZED IN THE WATER QUALITY CONTROL PLAN (INTERIM) SAN DIEGO BASIN 9 ARE NOT IMPAIRED.

2. IF, IN THE JUDGMENT OF THE STAFF OF THE REGIONAL BOARD, DAMAGE IS BEING DONE TO THE MARINE RESOURCES OF SAN DIEGO BAY OR ITS SHORES, OR SIGNIFICANT IMPAIRMENT OF BENEFICIAL USES INVOLVING AESTHETIC CONSIDERATION OCCURS, THEN THE DISCHARGER SHALL IMMEDIATELY BE REQUIRED TO CEASE OPERATIONS UNTIL ACTION IS TAKEN TO RECTIFY THE CONDITION.

3. THE DISCHARGE OF DREDGED MATERIALS OR DREDGE SPOIL RETURN WATERS SHALL NOT:

   (A) CAUSE DEPOSITION OF SLUDGES, OILY MATERIALS, BOTTLES, CANS, BROKEN GLASS, METAL PARTS OR PIECES, RAGS, PAPER, ROCKS, SHELLS OR OTHER SIMILAR OBJECTIONABLE MATERIALS ON THE BEACH OR BAY BOTTOM.

   (B) CAUSE OILY SLICKS OR THE OCCURRENCE OF FLOATABLE MATTER IN SAN DIEGO BAY.

   (C) CAUSE OBJECTIONABLE ODORS OUTSIDE OF THE IMMEDIATE VICINITY OF THE DISCHARGE POINTS.

   (D) CAUSE THE DISSOLVED OXYGEN CONCENTRATION OF BAY WATER TO BE DEPRESSED BELOW 6 MILLIGRAMS PER LITER.

   (E) CAUSE THIS BOARD'S OBJECTIVES FOR SAN DIEGO BAY AS ESTABLISHED IN THE WATER QUALITY CONTROL PLAN (INTERIM, SAN DIEGO BASIN 9 TO BE EXCEEDED.

   (F) CAUSE A POLLUTION

4. DREDGE SPOILS DISCHARGED TO THE WATERS OF SAN DIEGO BAY SHALL COMPLY WITH ANY APPLICABLE CRITERIA FOR SUCH DISCHARGE ADOPTED BY THE ENVIRONMENTAL PROTECTION AGENCY.

B. PROVISIONS

1. THE DISCHARGER SHALL COMPLY WITH THE MONITORING AND REPORTING PROGRAM NO. 74-99 AS SPECIFIED BY THE EXECUTIVE OFFICER.

2. PRIOR TO INITIATING ANY NEW POINT OR AREA OF DISPOSAL AT LOCATIONS OTHER THAN THOSE PROVIDED FOR BY THIS ORDER, THE U. S. ARMY CORPS OF ENGINEERS SHALL SUBMIT A SUPPLEMENTARY REPORT OF WASTE DISCHARGE DESCRIBING THE NEW POINT OR AREA OF DISPOSAL. REQUIREMENTS FOR THAT PARTICULAR DISCHARGE WILL THEREUPON BE CONSIDERED FOR ESTABLISHMENT BY THIS REGIONAL BOARD.

3. THE DISCHARGER SHALL GRANT ADMISSION TO THE DREDGING SITE AND WASTE DISCHARGE OPERATION TO MEMBERS OF THIS REGIONAL BOARD AND ITS STAFF AT SUCH TIMES AS MAY BE NECESSARY IN THE CONDUCT OF THEIR DUTIES IN CONNECTION WITH THE WASTE DISCHARGE REQUIREMENTS AND PROVISIONS ESTABLISHED HEREIN.

4. THIS ORDER SHALL BE VALID AND IN EFFECT UNTIL DECEMBER 9, 1977.

5. THE WASTE DISCHARGE REQUIREMENTS ENUNCIATED HEREIN SHALL BE APPLICABLE ONLY FOR A WASTE VOLUME OF APPROXIMATELY 1,806,000 CUBIC YARDS FOR DISPOSAL AT TWO SITES IN SAN DIEGO BAY AND FOR DREDGING OPERATIONS ASSOCIATED WITH THE SAN DIEGO HARBOR IMPROVEMENT PROJECT AS DESCRIBED IN THE FINDINGS OF THIS ORDER.

6. DREDGE SPOIL DISCHARGED TO THE PACIFIC OCEAN WATERS SHALL COMPLY WITH ANY APPLICABLE CRITERIA FOR SUCH DISCHARGE DEVELOPED BY THE ENVIRONMENTAL PROTECTION AGENCY.

I, LEONARD BURTMAN, EXECUTIVE OFFICER, DO HEREBY CERTIFY THE FOREGOING IS A FULL, TRUE, AND CORRECT COPY OF AN ORDER ADOPTED BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, ON DECEMBER 9, 1974.

Leonard Burtman

LEONARD BURTMAN
EXECUTIVE OFFICER

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

MONITORING AND REPORTING PROGRAM NO. 74-99
FOR THE DISCHARGE OF DREDGE SPOIL AND
DREDGE SPOIL RETURN WATER FROM THE
SAN DIEGO HARBOR IMPROVEMENT PROJECT OF THE
U. S. ARMY CORPS OF ENGINEERS

## MONITORING PROGRAM

THE DISCHARGER SHALL SUBMIT TECHNICAL REPORTS CONCERNING THE QUANTITY OF DREDGED MATERIAL DISCHARGED AND THE QUALITY OF BAY WATERS IN ACCORDANCE WITH THE FOLLOWING SCHEDULE:

## SCHEDULE

1. THE DISCHARGER SHALL NOTIFY THE REGIONAL BOARD BY LETTER, AT LEAST 48 HOURS PRIOR TO THE INITIATION OF THE DISCHARGE, AT EACH DISPOSAL SITE.

2. THE DISCHARGER SHALL KEEP DAILY ESTIMATES OF THE AMOUNT OF DREDGED MATERIAL DISCHARGED TO EACH DISPOSAL SITE AND THE MAXIMUM EXTENT OF THE VISUAL TURBIDITY CAUSED BY THE DISCHARGES. SAID ESTIMATES SHALL BE SUBMITTED TO THE REGIONAL BOARD AT LEAST WEEKLY.

3. THE DISCHARGER SHALL NOTIFY THE REGIONAL BOARD BY LETTER OF THE COMPLETION OF THE PROJECT AND THE TOTAL AMOUNT OF SPOIL DISCHARGED.

ORDERED BY Leonard Burtman
LEONARD BURTMAN
EXECUTIVE OFFICER

ALC:LVR

COMMANDANT
ELEVENTH NAVAL DISTRICT
SAN DIEGO, CALIFORNIA 92132

IN REPLY REFER TO

11010
Ser 32/86
6 JAN 1975

From: Commandant, Eleventh Naval District
To: District Engineer, Los Angeles District, U. S. Army Corps of Engineers

Subj: Disposal of dredge fill in San Diego Bay

Ref: (a) COE ltr SPLED-CN of 4 Dec 1974
(b) COMELEVEN ltr 11010 Ser 32/353 of 22 Oct 1974
(c) Conference bet Mr. Fischer, COE; CAPT Perez, NAB Coronado; CDR Taglienti, COMELEVEN Staff Engr

1. Reference (a) commented on a proposed compromise to the Navy position set forth in reference (b) because of objections by national and state agencies to disposal of dredge fill on Navy property within San Diego Bay. The conference of reference (c) provided further amplification as follows:

a. The Navy requires an inshore training beach which would encompass about 700 yards of usable beach for the training of personnel primarily in the beaching of landing craft and in the conduct of amphibious maneuvers. While an operational beach for amphibious landings is generally 500 yards wide, the requirement for basic training involves a greater margin for error by untrained personnel. A 100 yard buffer zone on each side of the boat lane should normally be adequate; however, a subsequent review of this requirement may be necessary.

b. While the opposition by the fish, game and wildlife agencies is appreciated, the Priority Two fill area south of DELTA Beach is still considered to be in the best interests of the Navy and the public with regard to public safety and recreation. However, in view of potential delays which would result in pursuing the matter of this spoil area further, the Navy does not desire to jeopardize the entire project of Bay dredging at this time.

2. Subject to the comments above and in the interest of expediting the dredging project of San Diego Bay, the Navy accepts the proposed compromise of 700 vice 900 yards at DELTA Beach.

F. B. Gilkeson

F. B. GILKESON

Copy to:
COMPHIBPAC
CO WESTNAVFACENGCOM San Bruno
CO NAVPHIBASE Coronado

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
1500 N. E. IRVING STREET
P. O. BOX 3737
PORTLAND, OREGON 97208

Reference: RB

Your reference:
SPLED-CW
January 7, 1975

January 29, 1975

Col. John V. Foley
District Engineer
Los Angeles District, Corps of Engineers
P. O. Box 2711
Los Angeles, California 90053

Dear Col. Foley:

This is in response to your letter regarding disposal of dredge material in connection with the San Diego Bay Navigation project.

We concur with the proposal for placing dredge material on Delta Beach south of the Naval Amphibious Base. It is understood this fill will extend 700 yards, toe to toe, as shown in red on the map submitted with the January 7 letter. We are pleased that the U. S. Navy has decided to abandon their proposal to fill the ecologically valuable mudflat south of Delta Beach. However, we are concerned that your letter fails to indicate that the Navy will compensate for the loss of marine habitat on Delta Beach by planting suitable areas of the proposed fill with eelgrass root stock. We believe it necessary that the U. S. Navy acknowledge in writing that they will, in consultation with the interested resource agencies, carry out a timely eelgrass revegetation program. Such acknowledgement should not be difficult to obtain as the Navy, in previous discussions and in their letter of October 22, 1974, indicated their desire to minimize impacts on the area's marine life.

As noted in our February 5, 1974, letter, we are not categorically opposed to the 5th Street fill. The San Diego Unified Port District's development concept for the proposed fill, as evidenced by preliminary designs (print dated May 23, 1974) and information contained in their July 30, 1973, letter to you, would seem to satisfy our criteria for such developments being water-dependent and in the best public interest. Nevertheless, as you are probably aware, once a fill is created we have little or no control over its subsequent development. Your suggestion

that the Port District intends to give this agency an opportunity to review plans and an EIR for development of the 5th Street fill is appreciated. We would be pleased to work with Port District personnel as they prepare and review plans for development of the 5th Street fill. However, political, economic, or social changes may result in strong pressures to deviate from the desired objective of providing the public with a marina and other recreational facilities. In an attempt to circumvent this kind of reversal, we ask that the San Diego Unified Port District provide us a letter of commitment stating they intend to develop the 5th Street fill so that the needs of the general public will be best served and that all facilities will be water-dependent and water-oriented.

We appreciate this opportunity to comment further on this project. We understand the Corps' desire to get this project activated, and we sincerely hope that these two remaining problem areas can be quickly resolved. If you wish to discuss the above or have any questions, please contact Mr. M. S. Zschomler at the Corona del Mar Area office.

Sincerely yours,

Donald A Hatukla

Acting Regional Director

APPENDIX 8

SOCIO-ECONOMICS
OF THE PROPOSED PROJECT

SAN DIEGO HARBOR,
CALIFORNIA

APPENDIX 8

SOCIO-ECONOMICS OF THE PROPOSED PROJECT
SAN DIEGO HARBOR, CALIFORNIA

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## APPENDIX 8

1. This appendix describes and evaluates the significant social and economic effects which would result from construction of the recommended project.

### NATIONAL IMPACTS

2. NATIONAL ECONOMIC DEVELOPMENT: The Port of San Diego master plan, land and water use element, provides for about 643 acres of water and 1225 acres of land for marine-oriented industry. The primary uses of marine-oriented industrial areas are dependent upon large ships, deep water and specialized loading and unloading facilities typically associated with ship building and repair, processing plants and marine terminal operations.

3. Deepening the channels adjacent to 10th Avenue and National City Marine terminal will enable larger ships (larger than currently able to use these berths and terminal areas) to on-load and off-load their cargo at these terminals. Savings in waterborne transportation costs are expected to range from approximately $0.20 to $2.00 per ton as a result of the use of larger vessels.

4. Industries limited to the primary industrial activities can be clustered together to capitalize on the benefit of reduced material handling costs, reduced on-site storage requirements, faster deliveries and a reduction in industrial traffic on public roads. The net effects of the reduced costs will be to lower the cost of American goods in foreign markets, thus stimulating export industries which results in increasing national income and employment.

5. Increased sales of American made goods will also improve the international balance of payments. Lower transportation costs will reduce the cost of foreign imports in American markets which will improve consumer buying power and lower costs to industries importing from abroad.

6. In the short-term, the national economy will be somewhat stimulated by the expenditure of large sums of money and by the temporary increase in employment of personnel required to construct the project.

7. In the long-term, increased facilities and employment at the harbor resulting from the movement of cargo at lower costs will have impacts on net national economic developments.

8. NATIONAL DEFENSE. The major impact the proposed project will have on national defense is to increase the cargo movement and handling at the port in support of military personnel and assistance to allied countries.

9. The project is expected to also reduce recreational and commercial ship traffic congestion to enable naval vessels of the Eleventh Naval District, a major naval installation at San Diego Harbor, to experience safer operating conditions.

## REGIONAL AND LOCAL IMPACTS

10. POPULATION. The recommended project will enable the Port of San Diego to maintain its competative position. Additional skilled and unskilled labor will be required. Some of the employment requirements will be met by in-migration of workers for construction of port facilities and by needs of industries producing containerized goods and handling bulk products.

11. These workers will relocate their families in the regional and local areas. It has been estimated by the port officials that four out of ten families in the area have significant direct or indirect dependence on foreign trade for their livelihood.

12. The population of the commercial tributary areas (excluding Mexico) has shown a steady growth since 1900 and this growth is expected to continue in the foreseeable future. In 1970, population was 4,228,000. This represented a 23 percent increase over 1960 population of 3,434,000. By 2020 the population of the commercial tributary area excluding Mexico is expected to be about 9,100,000.

13. The temperate climate, recreational facilities, tourist attractions, manufacturers of scientific and electrical equipment, and research and development have drawn large numbers of people to the area. These factors are projected to continue with significant increases.

## EMPLOYMENT

14. The National City Terminal, the Port's newest cargo facility, was constructed during the past 5 years with 50 percent financial participation of the Federal Government through the Economic Development Administration. Only a portion of the new development was set aside for cargo handling, while the remainder, approximately 77 acres, in accordance with provisions of the Federal Grant is intended for suitable water-oriented industry which will produce a high rate of employment with emphasis on ethnic minorities. Accordingly, about one-fourth of the entire area is now occupied by an International Telegraph and Telephone Company cable plant, which ships its products over the adjacant Sweetwater Wharf. Additional areas near this wharf, though presently unoccupied, are similarly intended for industries which need to be located near navigable waters. The project will help in the development and operation of the facilities. The availability of a good port in San Diego is a valuable asset to the industrial and manufacturing sectors of the county's economy in relation to their competitive position in national and international market places.

15. Employment in firms in the immediate tributary area, particularly those handling fertilizers potash, containerized cargo and scrap steel, is expected to significantly increase with increased channel depths. Land fills at 5th Avenue will result in additional commercial and recreational facilities and employment opportunities.

16. Reduced tonnage costs are expected to have the effect of increasing employment of truckers, railroad workers and longshoremen. These employment increases will have a multiplier effect in terms of increased employment of administrative, clerical and additional service-type industry personnel.

17. Additional commercial establishments selling imported goods are expected as a result of increased sales caused by lower prices.

18. The import of petroleum products after the project is constructed should help in maintaining a stable supply in southern California to meet the increasing demand.

19. To the extent that imports replace American productive facilities, production, distribution and employment will decrease. This adverse effect in terms of employment can be mitigated by more efficient production by American industries producing the same or substitute products as those which are imported.

20. REAL INCOME DISTRIBUTION. Project induced jobs (truckers, longshoremen, construction workers, surveyors, engineers and miscellaneous service employees) will create income to the extent that unemployed workers and new unskilled labor are employed.

21. Consumers of every income class should benefit from reduced transportation costs due to the wide range of goods imported (china, earthenware, toys, novelties, dry goods, canned goods, glass, frozen fish, frozen meat, foot wear, petroleum, lumber, molasses etc.).

22. Benefits will be distributed to skilled, professional and unskilled labor. Direct benefits will be realized by the Port and shippers. Increased employment in export industries will result in increased income for owners and employees.

23. Multiplier effect of the increased and widely distributed income will be felt by owners, managers, and employers of commercial recreation, sport fishing, boat repair and other commercial facilities at the Port as well as other commercial facilities in the area in close proximity to the Port as well as the immediate tributary area.

24. LAND USE. Dredged material will be used to create a new land area for a commercial and recreational site at the 5th Avenue area containing 22 acres.

25. Deepening the channel will stimulate the growth and development of marine-oriented industrial and commercial land use at 10th Avenue and National City marine terminals.

26. Fill from dredging will also be deposited at the naval beach area and the ocean side of Imperial and Silver Strand beaches, providing beach nourishment.

27. Expanded port activity will create changes in land use in close proximity to the project. Industrial, commercial and residential land use will be increased due to increased commerce and the needs of additional population induced by the project.

## TRANSPORTATION

28. The Board of Port Commissioners of the San Diego Unified Port District adopted a master plan on 19 December 1972 for harbor and port improvements and for the use of all tidelands and submerged lands which were conveyed to the district. The master plan consists of a master plan document and the three master plan maps which include: (a) a Land and Water Use Element Map containing provisions utilizing land and water areas for industry, military, commerce, recreation, resources preservation and public facilities; (b) an open Space Element Map covering parks and recreational areas, fishing facilities and research activities; and (c) a Circulation-Navigation Element covering belt line railroads, navigational and air terminal facilities and major roads and bridges.

29. The Circulation-Navigation Plan and Map indicate existing and proposed transportation facilities based upon existing and future transportation requirements. The proposed project will improve the waterborne transportation system through the harbor area. There are currently 8 miles of rail for 12 berths served at dockside.

30. The transportation plan incorporates the project and is expected to handle the projected volume of cargo passing through the harbor.

31. The major involvement of the Port District is in the provisions of arterial and collector streets to tideland facilities. Consideration may be given to extension of a bus system into the industrial, commercial and public recreation areas on Port District tidelands.

32. That portion of Mexico within the general tributary area is expected to experience a decline in the infant mortality rate (characteristic of the entire county) and migration northward toward the United States.

33. Assuming the projected population growth, an increased amount of general cargo will be required to satisfy the needs of the large population.

34. No attempt was made to quantify the effect of the project on population growth as it is obviously not amenable to quantification.

35. There will be no displacement of people directly or indirectly from the project.

36. Additional port transportation, industrial workers and their families, induced to the area by the project, will result in some increase in density, tax revenues, and cost of services. It is expected, however, that the increases in density and cost of services will not be large enough to have any adverse effects. Increases in tax revenues will most likely be more than offset by increased service costs to the additional residential units required to house additional project-induced population.

37. LOCAL FINANCES. A basic interest and goal during the early years of SDUPD's waterfront development was the elimination of a need for tax money support for operating expenses and for the repayment of any previously created debt. Revenues from property, marine terminal, and airport departments increased substantially as growth and progress occurred.

38. Since 1969, the Port of San Diego has been able to conduct operations, continue a current program of capital improvements, and provide debt service for larger-range projects without a tax levy.

39. During project construction, taxable retail sales are expected to increase due to purchase of project materials, services and expenditures by project workers and their families for personal comsumption items.

40. Project-induced population increases (additional port employees and marine-oriented industry employees and their families) will increase taxable retail sales.

41. Increase in fill land will generate new revenues for the Port.

42. Industrial and commercial lands in the immediate area of the project should increase in value, resulting in increased assessment and property taxes. This would be the consequence of increased commercial and industrial activity.

43. It is expected that industrial and commercial facilities will generate more public income than their cost.

44. On the other hand, the increase in residential use attributable to the project-generated population increase most likely will cost more in public services than the tax revenue generated by them.

45. AGRICULTURAL ACTIVITY. The proposed harbor improvements should provide the channel depths required to handle projected exports until about year 2000 of agricultural commodities, among which are potash, phosphates, fertilizers, cotton and alfalfa pellets.

46. Cotton has been a major export item through the San Diego Harbor for the past 15 years. The Orient, principally Japan, has been the chief buyer of U.S. cotton. Importers and users of cotton in the Orient prefer the cotton grown in the southwestern United States including California, over that grown in the southern states because of its finer quality.

47. Exports of potash used by Asiatic countries for manufacturing commercial fertilizers to grow food for their increasing population are projected to increase from approximately 128,000 tons currently shipped to about 640,000 tons in 2030. Potash is mined in New Mexico and is exported through the Harbor.

48. Other fertilizer exports are expected to increase from 181,000 tons to about 902,000 tons in 2030.

49. Adverse effects of increased exports of agricultural commodities are increased prices and shortages in this country. Additional resources will be needed to meet increased agricultural production resulting from worldwide requirements which would cause increased costs in other sectors of the economy which uses these resources.

50. RECREATION. Excess fill from dredging will be used by the Navy to enhance their beach. Dredged materials will also be deposited on the ocean side of Imperial and Silver Strand beaches. Although the project does not include recreation benefits, the fill will provide more area for recreation.

51. Deepening the channels should also result in reducing the traffic hazards by replacing many small ships with fewer large ships. Recreational boating at Shelter and Harbor Islands and additional recreational craft expected to berth at Chula Vista Yacht Harbor, Coronado Cays, Glorietta Bay and National City should experience more ease of access to and from recreational areas, more maneuverability and less traffic congestion. These factors should enhance the recreational boating experience.

52. PUBLIC FACILITIES. During construction of the project, the Navy will obtain water from California American Water Company for the period they are replacing the waterline to North Island.

53. Pacific Telephone and Telegraph Company will relocate their communication cables without interrupting service.

54. San Diego Gas and Electric Company will make provisions for furnishing utilities while they are replacing their power cables and gaslines.

55. Replacement facilities will extend the economic life of the utility lines producing a benefit attributable to the project. Project generated increases in population are not expected to result in the need for additional public facilities in the near future, although there will be some increased demand for utility services.

56. INSTITUTIONAL RELATIONSHIPS. During construction of the project, close cooperation will be required among the Port of San Diego Unified Port District, the Navy, the San Diego Gas and Electric Company and the Pacific Telephone and Telegraph Company in relocating and replacing utility lines.

57. Close cooperation between other affected agencies at the Federal, State and local levels will also be needed during and after project construction.

58. Agencies and utility companies have worked in harmony with respect to Port operations, indicating that no internal or external changes will be necessary.

## OTHER POTENTIAL IMPACTS

59. The project should not have any effect on community social relationships inasmuch as these relationships are well established with respect to the harbor which has been operational for many years.

60. Inasmuch, as communications and utility services will not be interrupted and people will not be displaced, the project will not affect community cohesion in these respects. Also, the local population appears to have readily accepted the need for the project.

61. During construction, noise levels will be raised due to dredging and land filling. After construction, increased activity at the Port most likely will increase noise. However, no significant impact is anticipated as the increase in noise levels resulting from the project is expected to be negligible as compared to existing noise levels.

62. The project is expected to cause community growth by inducing increases in population, employment and income.

63. No adverse impacts are expected to result from the project on esthetic values of the harbor (water, land or beaches) archeological resources, educational opportunities, or existing facilities.

APPENDIX 9

PUBLIC HEARING

SAN DIEGO HARBOR,
CALIFORNIA

APPENDIX 9

PUBLIC HEARING

SAN DIEGO HARBOR CHANNEL DREDGING PROJECT
SAN DIEGO HARBOR, CALIFORNIA

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## APPENDIX 9

## DIGEST OF PUBLIC MEETING

1. GENERAL: A public meeting was held by the District Engineer, Los Angeles District Corps of Engineers in City Hall, 243 National Avenue, National City, California, at 7:30 p.m., on 22 August 1973. Attendance at the meeting numbered about 100 and included representatives of Federal, State and City governments, railroad and water-borne shipping interests, commercial and civic organizations and representatives of citizens environmental groups. Colonel John V. Foley, District Engineer, presented the proposed plan of improvement of the San Diego Harbor, including several alternatives to dispose of the dredged material, and asked for comments.

2. DIGEST OF STATEMENTS: Summaries of the statements, written and spoken, follow:

a. Honorable Lionel Van Deerlin, Congressman, House of Representatives, Washington, D. C., expressed the hope that the San Diego dredging project would get started soon, as it is very difficult to keep unused construction funds in appropriations bills. Congressman Van Deerlin complimented the environmental interests in California as being reasonable and responsible, and indicated his support of placing sand on Imperial Beach.

b. Mr. Dudley D. Williams, Chairman of the Board of Port Commissioners, stated that the Unified Port District's Board of Commissioners approve this project and Plan 2 unanimously.

c. Mr. Don L. Nay, Director of the Port of San Diego presented the position of the commissioners and the port officials in developing and improving San Diego Harbor. He commended the Corps on presenting an excellent synopsis of the proposed project and stated that the voters of this region in 1962 voted overwhelmingly to transfer the tidelands of San Diego Bay to a Unified Port District. The legislature of the State charged the Unified Port District with the duty to develop the tidelands for commerce, navigation, fisheries and recreation. The commissioners and port officials have placed their assets and energies in the areas where they felt progress was needed. They have developed recreational areas and now feel the need to provide deep water. Mr. Nay stated that the Port must look to the future and prepare today for requirements 10 years from now. Because of ecological considerations, the port retreated from its former position to develop all of the South San Diego Bay industrially. However, the Port District does not intend to shirk its responsibility to provide for fundamental projects such as provision of deep water and restoration of the shoreline where there has been erosion. Port authorities feel that providing deeper water to South Bay is a necessity since the marine terminal built there represents a great public investment. Without dredging the channels, the terminal will not reach its full potential. In the northern part of the bay, the Port District desires to revitalize the area and improve the shoreline of urban downtown San Diego. Mr. Nay is interested also in the revitalization of the Silver Strand.

d. Colonel Foley read a letter from the City Council of the city of Coronado supporting the project.

e. Mr. Michael L. Ward, San Diego Coastal Zone Commission asked the question: "Does the Corps of Engineers plan to apply for a permit from the Commission to dredge the navigation channels and dispose of the dredge material?" Colonel Foley responded that the Corps would consult and coordinate action with the Coastal Commission. Mr. Ward was concerned over access to the existing and proposed D Street fill area if a permit for the Sweetwater flood control channel was denied. Mr. Ward's point was that if the access was not available, it might be better to place the proposed fill material elsewhere. Mr. Ward asked about the environmental impact statement and was assured that an E.I.S. had been prepared and would be furnished to him.

f. Mr. Kile Morgan, Mayor of National City, spoke in favor of the project. He said the Port District, the City of National City and all surrounding cities need an economic boost.

g. Mr. Jack Shelver, city manager of the city of Imperial Beach, said his city appreciates the support received (from others at the meeting) for deposit of dredge material on his City's beach. He pointed out that the need is great and that time is of the essence. He urged that the project include placing dredged material from the project on beaches of Imperial Beach.

h. Mr. Ralf Mall, California Department of Fish and Game, stated that his Department objects to the adoption of any plan that calls for deposition of material at the D Street and bayside fill sites. The Department has not objected to the use of 5th Avenue or Silver Strand Beach disposal (seaward) sites depending on the quality of the dredged material. He also believed that the Department Director, Mr. Ray Arnett, would favorably consider the Imperial Beach disposal site. The Department would favor depositing most of the fill on the seaward beaches and the remainder at sea. Objections to the D Street and bayside (U.S. Navy) fill areas are because of the destruction of the mud flats and loss of the eel grass beds along the bayside at the Silver Strand. These beds offer food for many fish and attachment of eggs of numerous animals. The black brandt is totally dependent upon eel grass for its food. Mr. Mall also questioned any proposed use of the existing 90 acres of fill at D Street.

i. Mr. Russell Earnest, field supervisor, Bureau of Sport Fisheries and Wildlife, said that the Bureau would not oppose the 5th Avenue fill if it is to the public benefit, the use required a waterfront location, and the jetty configuration would not adversely affect tidal exchange. The Bureau objected to the D Street fill because the proposed fill displaces feeding and resting habitat utilized by shore birds, and land that is not being utilized already exists at this site. The Bureau also opposes the bayside fill because this area contains the best ghost shrimp beds left in the bay and provides sites for feeding and resting of black brandt, least tern and brown pelican. The Bureau does not oppose filling on the seaward beach of the Silver Strand as long as the material is not contaminated

with heavy metals, etc. and the material is comparable with that now found on the beach. Mr. Earnest stated the project as proposed will result in a loss forever of valuable tidelands and will affect bird life and stimulate development which would destroy the Sweetwater Marsh.

j. Mr. R. W. Hauptli, Sante Fe Railway and Santa Fe Land Development Company, spoke in favor of the project and expressed a willingness to submit the low land area near the Sweetwater River, owned by the Santa Fe Railway, as a disposal site. He also said the Company favored Plan 2.

k. Mr. John M. Burns, San Diego Gas and Electric Company, expressed no position on the project but requested the earliest possible notification when actual construction is to take place so that utilities in the area can be relocated without delaying the proposed dredging.

l. Mr. Arthur Lyon, San Diego Chamber of Commerce, spoke in favor of the project and emphasized that the project was essential to the future of the Port and should proceed as soon as possible.

m. Mr. Kenneth A. Wood, National Steel and Ship Building, said they supported the project and had a definite interest in the D Street fill. Their basic desire is to reserve approximately 100 acres on the bay front for the construction of a 100 million dollar shipyard to construct super tankers and LNG tankers.

n. Mr. Charles E. Boyd, San Diego Bulk Terminal, discussed the effects, on all consumers, of the added costs related to waiting for high tide to dock deep draft vessels. He hopes the dredging will result in actually keeping any added costs from reaching the consumer.

o. Mr. Frank Boerger, California Marine Affairs and Navigation Conference, spoke of the importance of increasing landside facilities (roads, etc.) at the same pace that port facilities are improved. As a former commissioner on the San Francisco BCDC he mentioned his familiarity with the problems of this type of project and that he believes that this project will prove sensible and of large benefit to the Port.

p. Mr. Sam Graham, California Wildlife Federation, concurred in the views of U.S. Fish and Wildlife Services and urged only limited use of the marshes in San Diego Bay.

q. Mr. E. A. Keen, Citizens Coordinate for Century III, questioned the economic justification of any additional filling of the bay. However, he was in favor of using excess dredged material to provide additional beach at Imperial Beach.

r. Mr. Roscoe Poland, Conservation Chairman of the San Diego Audubon Society, opposed the project. His immediate concern was for the preservation of the remaining wildlife and its habitat in South Bay. He believes that disturbing and altering wetland bordering marshland is bound to have an ultimate detrimental effect on the marsh.

s. Mrs. Helen Scantlin, Environmental Action Council, opposed the proposed plan to spend over 11 million dollars to dredge San Diego Bay because she believed that the project is environmentally undesirable and a gross waste of the taxpayer's money.

t. Mrs. Charles MacKenzie, Private Citizen, expressed concern for the disposal of dredged material on the bayside of the harbor near Coronado because it would disrupt recreational use of the area as well as destroy bird life.

APPENDIX 10

DRAFT
SECTION 221 AGREEMENT

SAN DIEGO HARBOR,
CALIFORNIA

APPENDIX 10

DRAFT

SECTION 221 AGREEMENT
SAN DIEGO HARBOR, CALIFORNIA

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DRAFT
AGREEMENT BETWEEN

THE UNITED STATES OF AMERICA

AND

THE SAN DIEGO UNIFIED PORT DISTRICT

THIS AGREEMENT entered into this day of , 1975 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this Agreement, and the San Diego Unified Port District (hereinafter called the "District"),

WITNESSETH THAT:

WHEREAS, construction of a channel improvement known as the San Diego Harbor Dredging Project, San Diego Harbor in San Diego County, California (hereinafter called the "Project"), was authorized by Public Law 90-483, 90th Congress, 2d Session approved 13 August 1968;

WHEREAS, the District hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by the Federal legislation authorizing the Project and by other applicable law; and

WHEREAS, the District is empowered to enter into this Agreement by reason of the authority of

NOW, THEREFORE, the parties agree as follows:

1. The District agrees that, if the Government shall commence construction of the San Diego harbor dredging project, San Diego Harbor in San Diego County, California, substantially in accordance with Federal legislation authorizing such Project (Public Law 90-483, 90th Congress, approved 13 August 1968), the District shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-Federal cooperation specified in such legislation, to wit:

a. Contribute in cash 4.1 percent of the first cost of dredging, exclusive of the cost of spoil-retaining works, presently estimated at $519,000 such contribution to be made in a lump sum prior to construction;

b. Provide without cost to the United States, all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also provide necessary retaining dikes, bulkheads, and embankments therefor or the costs of such retaining works;

c. Subject to Section 9, Public Law 93-251, hold and save the United States free from damages that may result from the construction and maintenance of the project;

d. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms;

e. Provide and maintain without cost to the United States depths in berthing areas and local access channels serving the terminals commensurate with depths provided in the related project areas;

f. Accomplish without cost to the United States such utility or other relocations or alterations as necessary for project purposes, except for such utilities as are owned by the United States Navy; and

g. Establish regulations prohibiting discharge of pollutants into the waters of the harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control.

2. The District hereby agrees that it will comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894, Approved 2 January 1971).

3. The District hereby gives the Government the right to enter upon, at reasonable times and in a reasonable manner, lands which the District owns or controls for access to the Project for the purpose of inspection, and for the purpose of operating, repairing or maintaining the Project, if such inspection shows that the District for any reason is failing to operate, repair or maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the District Official. No operation, repair, and maintenance by the Government in such event shall operate to relieve the District of responsibility to meet its obligations as set forth in paragraph 1 of this Agreement, or to preclude the Government for pursuing any other remedy at law or equity.

4. This agreement is subject to the approval of the Secretary of the Army.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

SAN DIEGO UNIFIED PORT DISTRICT

By
Chairman, Board of Commissioners

THE UNITED STATES OF AMERICA

By
JOHN V. FOLEY
COL, Corps of Engineers
District Engineer
Contracting Officer

DATE:

APPROVED:

Secretary of the Army

ATTEST:

By
Secretary, Board of Commissioners

The undersigned, as Chief Legal Office for the San Diego Unified Port District, having considered the effect of Section 221 of Public Law 91-611, approves the foregoing Agreement as to form and legality this day of , 1975.

District Counsel
San Diego Unified Port District

DATE

FILMED

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